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# BREAD AND BETTER THINGS

IDRC REVIEW



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# BREAD AND BETTER THINGS

Clyde Sanger









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## Introduction

Several times during the last 30 years there has seemed more irony than promise in the motto of the Food and Agriculture Organization. "Fiat panis" — let there be bread. The words may have sounded like a god's blessing when they were first uttered in 1945 in Quebec City at the founding conference of this United Nations agency. But to a Bihari caught in the Indian famine of the mid-1960s or to a Tuareg in the drought that bleached the Sahel in 1972, they were sour words. The world had failed them.

Yet many who should know affirm that, even though the world's population doubles within 30 more years, there can be bread enough for everyone. The IDRC president, David Hopper, said recently: "Never before in human history has mankind been faced with such opportunity for food abundance".<sup>†</sup> Modern agricultural technologies offer this opportunity. Nor does the promise stop at an adequate basic diet. On the foundation of increased income for rural people derived from greater food production can be built a better life for the next generation. That is why this review of the research which the Centre is supporting in developing countries, research particularly focussed upon ways to improve the economic and social wellbeing of rural peoples, is called "Bread and Better Things". It is not a naive hope. Man's selfishness or lack of will may, to be sure, frustrate the hope, but the technology exists to assure abundance.

IDRC is organized, for purposes of administering research projects, into five program divisions. They are: Agriculture, Food and Nutrition Sciences; Information Sciences; Population and Health Sciences; Publications; and Social Sciences and Human Resources. In annual reports we have described the work done by the Centre by covering each of these program divisions in turn. We follow the same procedure in the 1974-75 annual report that is a companion volume to this booklet. For this review, however, it seemed more logical to take a different approach.

An ordinary reader is not interested, after all, in the administrative compartments of the Centre but in the problems that the Centre tries to help solve. So this review is problem-oriented. What is IDRC doing to help increase world food production? What is it doing to help tackle the problems of poor sanitation, contaminated water supplies, a lack of basic health care in rural communities? What is it doing to help countries that are on the path to industrialization, both with practical factory-floor advice and with broader assistance as they decide their policies on the transfer of technology? What is IDRC doing to help mobilize existing and new information connected with all such problems? In organizing the material to answer such questions, we can also bring out the pattern of purpose, and the main strands of concern, behind the 250 or more research projects which the Centre has supported during the last five years; and we can show the interweaving of the work of the different divisions in this pattern.

The year under review, April 1974 to March 1975, witnessed two major conferences on issues that are the main concerns of the Centre: the World Population Conference in August at Bucharest, and the World Food Conference in November in Rome. This review follows the same order, covering first the population issue and then the issue of food production. There follows a more wide-ranging section on modernization and change. In each section two or three detailed descriptions of projects are included, to add some color to the main narrative. They are set apart, short digressions from the main track, but intended as an integral part of the descriptive journey, nevertheless.

Before starting on the narrative, a reader may find that a few basic facts about the International Development Research Centre will be a useful guide. They follow.





## Some basic facts about IDRC

### When was the IDRC set up?

The Centre was established by an Act of the Canadian Parliament assented to on 13 May 1970. The first meeting of the 21-member Board of Governors took place in October 1970.

### Why was it set up?

It was set up (in the words of that Act) "to initiate, encourage, support and conduct research into the problems of the developing regions of the world and into the means for applying and adapting scientific, technical and other knowledge to the economic and social advancement of those regions".

It was established as a public corporation, to give it the greatest possible measure of flexibility and autonomy while still being accountable to Parliament. Its funds are in the form of "untied aid", which allows it to secure the best available professional skill, and to finance projects in the most appropriate way, regardless of the origin of the research workers and the source of equipment.

It has placed heavy emphasis on support for research workers indigenous to the developing regions. The great majority of projects are being carried out in those regions, and all of them are under the direction of a scientist or administrator of that region. Research financed by the Centre in Canada, at universities and elsewhere, is undertaken in support of field projects in developing regions. This emphasis has been taken to fulfill the objective of the Centre, as stated in the Act, "to assist the developing regions to build up the research capabilities, the innovative skills and the institutions required to solve their problems".

### How much has been done?

From October 1970 to March 1975 the Board approved support for 252 projects, which required appropriations of \$50.1 millions. A few projects involve expenditures of more than \$1 million, while others involved less than \$5000; the average has been \$200,000. Some 38 projects have been completed. Research has been taking place in 75 different countries.

### What are the principal sectors in which research has been supported?

Research to improve food production and nutrition has been a foremost concern. Crop research in the semi-arid tropical regions was a starting-point for this agricultural research. Improvement of health care in rural communities, and an understanding of the many variables that influence couples in deciding the size of their families. An understanding of the processes of modernization and change, and of the social, economic, political and cultural consequences of change. Improvement of the means of collecting and disseminating information for and about development.

### How international is IDRC?

The Board of Governors consists of 11 Canadians and 10 non-Canadians. Six Governors are drawn from developing countries.

In May 1975 the staff totalled 330, of whom 266 were Canadian. The 64 non-Canadians came from 26 different countries. The Centre has established four regional offices — in Singapore, Bogota, Dakar and Beirut (and a fifth soon in Nairobi) — and each is headed by a national of the region. Some 78 members of the staff work in these regional offices or at other places outside Ottawa.

### How does it fit in with the work of the Canadian International Development Agency?

IDRC has been the managing agent for CIDA's two largest grants in agricultural research (in triticales development and cassava-swine research). Staff from each organization attend the other's project review committee meetings. In principle, IDRC supports the more innovative and risky research, and passes to CIDA proposals for larger-scale support of projects incorporating proven new technologies.

† "To Conquer Hunger: Opportunity and Political Will". Address given at Michigan State University, 16 May 1975 (reprinted as booklet IDRC-048e).



# 1974 1975

## People and Health

The World Population Conference took place in Bucharest in the middle of the year under review. It provided a yardstick by which to measure the work which IDRC had been supporting, and gave pointers to where support might go in the future. George Brown, director of the Centre's Population and Health Sciences Division, summed up on the lessons of the Bucharest Conference in these words:

"Over the past four years the Division has developed a research program that is broadly congruent with the recommendations of the World Plan of Action. This program places population concerns in the broader development context. It seeks to increase our understanding of the relationship between population variables — fertility, mortality and migration — and other development issues including economic levels, education, employment, agriculture, health, urbanization and the role of women, to mention a few of the most important".

The emphasis on breadth means that the research supported by the Centre in the area of population and health involves a wide range of disciplines, from the physical sciences (research on contraceptive technology, tropical diseases and sanitary engineering) to the social sciences (experimental health care delivery systems and investigations of the dynamics of population change). The sections that follow give some idea of this broad approach.

### Population Policies and Dynamics

The Centre's basic approach, of encouraging scientists in developing countries to identify their own research, fits well with the views strongly expressed at Bucharest that every country must elaborate its own policies on population and development. To help draw social scientists in developing countries into collaboration with decision makers on population issues, the Centre began supporting in 1974-75 a variety of programs in line with this aim. One of these

is the PISPAL program (Social Research on Policy-Relevant Population Problems in Latin America), which involves a group of Latin American institutions in a collaborative research program. With a similar objective, an awards program was launched in Southeast Asia to encourage young social scientists working in the population field, and the first 13 awards were made in January 1975, to candidates chosen by a selection committee of Asian scientists.

Investigating the factors that determine fertility behaviour involves many different approaches. Social scientists in Thailand, the Philippines and South Korea completed a study of the value of children to parents, in which they found some striking cross-cultural similarities, as well as some sharp differences in view between husbands and wives. A regional Committee on Comparative Behavioral Studies in Population (COMBEP), with headquarters in Seoul, was formed as a result of this collaboration; and an enlarged group, including Turkish researchers, is now starting to relate these findings to policy issues and family planning programs.

When patterns of population change differ between areas inside a single country, researchers are gathering demographic data that can help pinpoint the causes. Demographic surveys of this kind have been supported in Brazil, Tanzania and Zaire. [(See page 8, a description of the work done in the two African countries).]

Other population projects have focussed on a particular variable. The economic circumstances of families, the financial contribution and cost of children in a family's budget, are being studied by researchers in Senegal and Thailand. The various causes and effects of migration are being assessed in Central America and Upper Volta. Meanwhile, the Colombian Association for the Study of Population is coordinating a study of the changing role of women in the society of a country that is in transition to a modern indus-





trialized state, to analyze how these changes affect patterns of marriage and contraception — and in turn affect fertility rates and population trends.

Social scientists are also concerned about the other side of the coin: the effects of population change in terms of demand for jobs, housing and various services. Following the large study of rural-urban migration to eight metropolitan cities in Latin America and Asia, which ended in 1973, a smaller study of the same sort has been supported in Papua New Guinea; there the focus has been upon the job opportunities open to those who move from rural areas to the coastal cities. In Turkey data from the 1970 census is being analyzed to bring out the implications of the existing and projected population growth in all 67 provinces as it affects needs for additional housing, health care, food and employment and educational opportunities.

### Contraceptive Technology and Family Planning Services

Delegates at Bucharest readily acknowledged the need to develop new methods of fertility regulation, as well as better ways of delivering family planning services. Last year's annual report described the work being done on contraceptive techniques under the WHO Expanded Program of Research on Human Reproduction, to which IDRC made two contributions. It also mentioned the network organized in Central America to do biomedical research and to develop contraceptive methods considered most appropriate in that region. During 1974-75 the International Committee for Contraceptive Research, supported by an IDRC grant of \$500,000, undertook to evaluate promising leads in research on new types of contraceptives. The ICCR, a standing committee made up of researchers from six countries, is working with pharmaceutical companies so that proprietary materials are made available for testing and development.

Early in 1975 a new network of research on human reproduction was formed of doctors and scientists in universities in Singapore, Malaysia and Indonesia. Like the earlier one established between six institutions in Mexico and Costa Rica, it should lessen the dependency on research done in the developed world; and the Asian scientists will have the opportunity to concentrate on methods likely to be locally most acceptable.

Innovative approaches to the management and delivery of family planning services have been supported in several countries, including Mali and Thailand. The Thai experiment, seeking ways to integrate the country's 13,000 traditional birth attendants into the national family planning program, is described in the section on page 10. In Mali, the pilot project that began in 1972 to establish a family planning clinic in the capital, Bamako, was completed during 1974. The clinic was organized to offer health care services to mothers and children, as well as advice on family planning. The Malian authorities considered the pilot

scheme so successful that they decided to extend the program to seven regional capitals, as well as opening other clinics in Bamako; they are thus shifting the pilot scheme into a national program of family planning, the first to be established in sub-Saharan francophone Africa. IDRC is contributing \$243,500 to this second phase.

### Rural Health Care Delivery

Many countries in the Third World have begun looking for alternatives to the physician-based, curative orientation of health care favoured in the rich countries. They are searching for ways of providing comparatively low-cost services to the largest number of people: this means, in effect, basic health care of a preventive nature being made available to rural communities.

Two publications, produced by the IDRC during 1974-75, illustrate this trend. One is a booklet *Doctors and Healers*, written by Alexander Dorozynski. The other is a bibliography compiled by Shahid Akhtar on *Health Care in The People's Republic of China*, which contains abstracts on 560 books, articles and unpublished papers written on this topic. The Chinese "barefoot doctor" program has aroused wide interest in the 16 years since it was first launched, and authorities in many developing countries have wondered how it might be adapted to the conditions of their own regions; this 182-page book should therefore prove a useful guide in many quarters. To ease the work of compilation, the author was able to make use of the Centre's ISIS computerized information system that has been installed for library management and information retrieval as participants in a worldwide network. Further volumes of bibliography, complete with abstracts, on rural health care in other developing countries will be published as they are completed.

In supporting action research in this area, the Centre's main focus has been on experimentation with rural





health care systems that are based on the use of auxiliary health personnel. An ambitious pilot project of this kind is now under way in hilly country south of Cali, in Colombia, where the training of auxiliary health workers is only part of an attempt to provide a complete health care system inside a rural development program. In neighboring Venezuela an evaluation was carried out during 1974 of the "simplified medicine" program that has been operating for 10 years and is built on a pyramid of health care whose base is the medical auxiliary running a village clinic and referring more difficult cases to doctors and nurses in health centres and district hospitals. The evaluation report will soon be available. Conferences on health manpower needs and the use of medical auxiliaries were sponsored at Medellin in Colombia for 50 Latin American government and university leaders who plan manpower programs, and in

Malawi for policymakers from 8 countries in East and Southern Africa.

In Asia, there were encouraging results from the project in southern Iran where the first village health workers have finished their training and are on the job in their home districts. A description of that project appears on page 12. A slower start has been made in Nepal, where the government with IDRC support is undertaking an analysis of the country's health needs and resources, as a basis for developing training curricula and a comprehensive health manpower plan. It is a dauntingly large task to make such a plan for 12 million people scattered over mountainous country; but the project is expected to continue during 1975-76.

Some areas in the Third World lack any means by

## Demography – data aids development plans

Demographic studies in the neighbouring countries of Zaire and Tanzania began in 1973 and neared completion during 1974-75. Although the projects in each country were different in several respects, they had the common purpose of providing data on population and fertility rates for national government use in further development planning. IDRC provided funds for the research and for the two teams to meet and compare notes.

Work in Zaire consisted of a survey of the population of three major cities: Lubumbashi, Kisangani and Kananga, (formerly known as Elisabethville, Stanleyville and Luluabourg). The survey was undertaken by the National Institute of Statistics (INS) under its scientific director, Nzeza Zi Nkanga. The interviewing teams used a questionnaire which covered details of migration, housing and employment as well as data for the calculation of fertility and mortality rates. The interviewing was completed in mid-1974. While the data for Kisangani had been tabulated by December, in general the work of data processing has gone more slowly than was expected because of a lack of programming skills and computer time.

Similar problems with data processing have slowed the progress of the national demographic survey in Tanzania. There the field work was very extensive, covering 112 sample areas in 18 regions, of which 70 were rural clusters. During the five months of data collection at the end of 1973, the 260 enumerators endured difficult conditions of travel and rough living in areas where food was often scarce. But they collected basic information on 268,000 individuals, including data on health factors that relate to fertility trends. During 1974, under the direction of Professor Roushdi Henin at the University of Dar-es-Salaam, the data was coded, punched and validated. Early in 1975 the first output from the tapes was available; it will be used in the final version of the 1975-79

### Five-Year Tanzanian Development Plan.

The two projects highlighted a problem that appears common throughout Africa: a lack of skills in data processing. However, advances were made in training and in future planning. In Zaire further demographic work is being done by INS staff in collaboration with the National University. In Tanzania five senior staff of the Bureau of Statistics and the University got valuable field experience which will be of particular benefit during the 1978 national census.

The Tanzanian Government also showed in a most tangible way the importance it attached to the project. Because of delays and other factors, there was an over-run of costs, which the government covered entirely. Its direct contribution to the project increased to \$171,430, while the IDRC grant remained at \$74,000.





which ideas can be exchanged at a popular level on a broad range of subjects from nutrition and hygiene to community mobilization for development. A gap of this sort was identified by people in the francophone states of West Africa, and the Centre sponsored a meeting in December 1973 in Dakar to explore how this gap might be filled. The 24 participants included doctors, health workers, teachers, members of trade union groups, district authorities and leaders of women's organizations. The meeting showed they favored the launching of a magazine which would focus on issues of family health including sex education and family planning, and would also cover wider issues of development to which these more immediate family concerns are related. Plans went ahead to produce a magazine *Famille et Développement*, published in Dakar and edited by Marie-Angélique Savané and Pierre Pradervand. A sample issue created much enthusiasm throughout the region, and a first issue (with a print run of 40,000 copies) was produced in January 1975, with the second issue following in April. The Centre has made a three-year \$644,000 commitment to support this periodical, which is starting as a quarterly and may become bi-monthly.

### **Water supplies and waste disposal**

A major cause of death among young children in developing countries is gastroenteritis, which can be traced to poor sanitation and contaminated water supplies. Prevention of sickness derived from these sources is a massive task, on which relatively little research has yet been done. The problem is often worse in rural communities. The Centre co-sponsored with the UN Development Program a meeting in Montreal in April 1974 to discuss the problems of

research and program development in rural potable water and sanitation. The keynote document for this meeting of representatives of seven international agencies was a report to the IDRC prepared by Professor Ian Burton of the University of Toronto. The agencies agreed to form a working group whose job it is to outline a 5 to 10-year program by which technological information can help speed up the provision of water supplies and sanitation services to rural communities in the Third World. Chairman of this working group is Dr. Myer Cohen, who was formerly Deputy Administrator of the UNDP and is now working as an IDRC consultant.

The working group has recommended the creation of a network of regional and national centres, which could promote projects and programs of adaptive research and training. The centres would also develop techniques and materials to promote community involvement and create a system for collecting and spreading information.

IDRC's involvement has now moved to the phase of helping design an information system and supporting projects. On the informational side the Centre published, as a by-product of Dr. Burton's work, an 82-page annotated bibliography *Rural Water Supply and Sanitation in Less Developed Countries*, by Anne U. White and Chris Seviour, and is now working to help set up the network's international information system. The first research projects supported were in Tanzania, where tests are being carried out on types of compost toilets to adapt them for tropical conditions; and in Peru, where the performance of a water treatment plant is being evaluated. It is likely that many future projects will be in Asia, where the benefits of Latin American experience in this field





may prove useful.

### Disease prevention

The prevention of tropical diseases is a vast field, in which many specialists have worked for a long time. The Centre, arriving on the scene at a stage when there is rising concern about the effects on the environment of chemical pesticides, has concentrated its support on research into biological control of vector-borne diseases. The first of these was the work on the control of the blackfly vector of onchocerciasis, the scourge in West Africa known as river blindness, by means of a parasitic worm or mermithid. A section in last year's annual report gave details of the work being done in Ivory Coast and Upper Volta, as well as the collaborative research at Memorial University in Newfoundland. During 1974-75 this parallel research continued to make



## Thai midwives – updating traditional skills

The government of Thailand set a goal of reducing the country's rate of population growth from 3.2 percent to 2.5 percent during the period 1971-76. But nurses and government midwives are not numerous enough to organize health care and family planning services throughout rural areas, where 80 percent of Thailand's 42 million people live. A neglected resource in this campaign seemed to be the 13,000 mohtamyae, or traditional birth attendants (TBAs): ordinary village women, who spend their days farming or keeping house, but who are called upon once or twice a month to attend a mother in childbirth, having mostly learnt this skill from a grandmother. Many mohtamyae had been given training, by the Ministry of Public Health supported by UNICEF, to improve their delivery technique. But no study had been undertaken of the part they might play as motivators for family planning in their villages.

Staff from Mahidol University's Faculty of Public Health began such a study in 1973, supported by IDRC with a contribution of \$39,700. They chose four areas in central Thailand, and worked with a sample group of 136 TBAs. In three areas the mohtamyae attended a four-day training course, during which they were given talks not only on improved delivery methods (each of them was given a UNICEF delivery kit at the end) but also on broader population

questions and the part they could play in the national campaign by motivating the mothers to family planning during the appropriate period after childbirth. The fourth area was left untouched, as a control group. Further, in two of the areas where training took place, the mohtamyae were also offered an incentive of 10 baht (50 cents) for each new acceptor.

They were interviewed in 1973 before the training course and again a year later in mid-1974, to learn what effect the course had on them. The survey, directed by Dr Srisomang Keovichit, showed that TBAs who were over 50 years old (as were the great majority — 106 out of the 136 in the sample) were usually not keen to work on behalf of family planning: they were tired from other activities, or had difficulty in walking, or had other reasons. The younger and more literate group was far more interested, and about half of them became active motivators. The incentive scheme was only partially successful, since many mohtamyae were reluctant to spend a bus fare to travel to the clinic for their reward.

Yet the project has produced useful recommendations which Dr Srisomang is presenting to government. Chief among these is that, as is now the case in Malaysia, the government should become involved in



progress, particularly in the study of different chromosome types of blackfly and in the tracing of mermithids to the smaller rivers. The project is likely to move into a second phase of financing in the coming year.

Progress in the control of onchocerciasis, while slow, is encouraging enough to take a similar biological approach with other tropical diseases in Africa. These include trypanosomiasis, the sleeping sickness that is spread by the tsetse fly, and schistosomiasis, for which the intermediate host is a snail that lives in slow-moving waters. The World Health Organization has taken moves to create an international research program on these and other tropical diseases, and the Centre is cooperating in the planning phase of this endeavour.



seeing that younger mohtamyae are selected and trained, and that the working link between them and the government midwives is greatly strengthened. The government has taken a step in this direction by instituting a training program in four provinces of Northeast Thailand.

A 25-minute film was made of the mohtamyaes' training and work, and copies were printed with Thai and English narration. A travelling seminar on the role of TBAs in family planning, which drew together health officials from Indonesia, the Philippines and Malaysia as well as Thailand, took place in July 1974; and the papers were published by IDRC. Subsequently in 1975 IDRC has committed \$42,500 to a broader-based project in rural northeast Thailand through Khon Kaen University which involves the training of village volunteers as auxiliaries in health and family planning and as distributors of contraceptives.



## Iran's volunteer health workers win acceptance from all

Iran has about 10,000 physicians; but half of them practice in Tehran and another third in other big cities. That leaves some 1500 physicians to look after 23 million people in smaller towns and rural areas. The Rural Health Corps, in which medical and dental graduates do a two-year stint in national service, has set up 400 stations and provides mobile clinics. However, more than half Iran's 55,000 villages are not covered by any form of health care.

In 1973 the Department of Community Medicine at Pahlavi University, supported by an IDRC grant of \$147,600, began a pilot scheme to train village health workers in Fars province in southern Iran and to study their work over a two-year period. By early 1974 a group of 16 villagers, who were literate but did not have more than six years' schooling, had been selected and given six months' training in basic health care. They began their field work, back in their own villages, in April 1974.

The work has gone well. All 16 VHWs have stayed at their job (although one ex-farmer was briefly tempted away to work in a cement factory). In the first six months they treated 4,875 cases, and the number of patient visits was rising each month. About half the clients' complaints dealt with by the VHWs were gastrointestinal (childhood diarrhea has been a common cause of death here) and upper respiratory infections (colds, sore throats, grippe). Women, and

children under four have made particular use of VHW services. The health workers also visit up to four homes a day, for follow-up care of patients, examination of babies and talks on nutrition and sanitation. They also visit schools and examine students for personal hygiene and communicable diseases.

There have been problems. The number of forms on which VHWs had to record these activities increased to overwhelming proportions; so the record-keeping system was revised and streamlined. It has been difficult to follow through with projects of better sanitation, even though villagers became enthusiastic for improvements, because of lack of materials and funding. A rapid turnover in the post of physician in the area has hampered plans for regular supervision of the VHWs (Pahlavi University has provided its own supervising physician).

Nevertheless, the pilot scheme seems to have won acceptance both from the villagers and from the government, which has funded the training of a second group of 30 VHWs. Dr Hossain Ronaghy of Pahlavi University, who has been directing the project, is now concerned that this scheme be integrated with other similar health worker projects in Iran, in a coordinated effort to provide primary and preventive health care for everyone.





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## Food Production

Much of the public interest in the World Food Conference in Rome last November centred upon the response of the rich countries to the possibility of further famine in Africa and Asia and their readiness to contribute, in cash or grain, to a world food reserve. Canada took a lead at that conference in pledging 1 million tons of grain a year for three years. Such a reserve can be an insurance against calamity in countries with relatively small populations, like the states of Sahelian Africa. But food aid, however promptly provided by the four grain exporting countries (the United States, Canada, Australia and Argentina), cannot be of more than marginal help at times of shortage in the major populated areas of the world.

This point was underlined by IDRC President David Hopper when he addressed the Centre's Board of Governors in March 1974. He said:

"For India, Indonesia, Pakistan, Bangladesh and much of Southeast Asia, the only prospect for a true food reserve is the enhancement of their national agricultural capacities to produce minimal needs in a drought year. It is to their own agricultural economies that they must turn for protection."

But can they produce enough for their minimal needs? Because of the current world shortage of fertilizer and other factors, Dr Hopper could only be gloomy about the prospects for these large countries if a widespread drought such as that experienced in 1972 recurred during the next several years. About the longer term he was more optimistic, and concluded:

"Even for land not blessed with nature's largesse, modern agricultural technologies offer great opportunities to enjoy the benefits of a prospering agriculture. The irrigation technologies developed in Israel; the discoveries now being made in plant drought resistance and photosynthetic efficiency, in pest and

pathogen resistance, and in maximizing the product of the symbiotic interactions of plant, soil, water and sunlight; the improvements in the effectiveness of farm production inputs and in the elimination of waste in the processing and handling of farm products; and the work under way to upgrade the nutrient quality of the food produced — all these open vast new frontiers through science to provide an assurance that all can eat."

These are the varied areas of research which the Centre has been concerned to support in its efforts to help increase world food production.

### International Centres and 'Outreach' Programs:

Much of this work demands basic research of a kind that can only be done in large institutes. For this reason, the Centre has contributed to programs of crop research at the major international agricultural centres in tropical regions — in Mexico, Colombia, Nigeria, India, Lebanon and the Philippines — but it has also on occasions added linkages in two directions.

One direction is further back, to even more fundamental research at Canadian universities that is supportive of the work at these tropical centres. An example of this is the grant made in mid-1974 to the University of Saskatchewan to carry out studies on hormonal control of stress and other physiological factors that may be the key to breeding varieties of sorghum that will produce high yields under conditions of continuous or intermittent drought. This five-year study in Canada is closely linked with the collection and breeding of sorghum at two centres in Third World countries — the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the Arid Lands Agricultural Development program (ALAD) in Lebanon.

The other direction is onward from the big research station to smaller liaison stations, where improved





varieties are tested in a range of climates and environments. To take the example of a different crop, triticale, a man-made cross between wheat and rye which has been shown to perform well on marginal lands where yields of wheat decline. Some fundamental research on triticale has been done at the University of Manitoba, backing up the major plant breeding program at the International Maize and Wheat Improvement Centre (CIMMYT) in Mexico. During 1974 IDRC funds totalling \$600,800 helped establish field trials across a network of testing stations — in northern India, in the Kenya highlands, in Algeria and in Chile. Each of these trials should have findings of interest to the other regions: the Kenya trials, for example, are concerned with breeding varieties resistant to “rust” fungus.

The crop research on the cereals triticale, sorghum and millet and on the rootcrop cassava has been described in some detail in earlier IDRC publications, either in annual reports or issues of the quarterly *IDRC Reports*. Both for this reason, and for the reason

that grain legumes can provide the protein needed to balance the bulk of these other staple foods of tropical regions, we are giving more space in this review to the work that has been supported in research to improve pigeon pea, chickpea and other legumes (see below). Research in grain legumes has involved breeding programs at regional centres and field trials in different countries.

Particular attention will also be given to a number of oilseed crops, including sesame, safflower, ground-nuts and rape, which are both good sources of edible vegetable oil — of which there is a serious world shortage — and of edible protein.

### Post-Harvest Systems

There is a heavy loss, or wastage, of food between the point of harvesting and the time of consumption. Estimates of loss have run as high as 30 percent. Yet researchers have until recently concentrated on the problems of improving production in the farmers' fields, and largely ignored the companion problems

## Grain legumes – no longer a neglected crop

Legumes are important in the developing world because they are the cheapest available source of edible protein. Pigeon pea, a woody shrub that produces pods over a six to nine month period sometimes extending to two- or three-years, is grown from India (where the dried peas are cooked in the traditional pulse dish of “dhal”) to the West Indies. Pigeon-pea and chick-pea, which though a very much smaller plant has a strong tap-root that allows it to survive drought conditions in India and West Asia, are major sources of protein in that region. Like the cereal grains of the semi-arid tropical regions, sorghum and millet, these grain legumes have been neglected by research scientists until recently. The yields have been low: the average yield for pigeon-pea is about 600 kilograms a hectare, and for chick-pea less than 400 kg. Yet experimental plantings have shown that they have a potential of 8 to 10 times that yield.

IDRC has been involved in the building of a world network of research in grain legumes, with focal points in India at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and in Lebanon at the Arid Lands Agricultural Development program (ALAD). It has also supported research on a national basis elsewhere, for example in Trinidad and Algeria. In other countries, like Senegal and Tanzania, research on legumes is part of intercropping experiments with sorghum and millet. Here there is room only to bring out the highlights of this program, which has so far involved IDRC commitments of nearly \$3 million.

In **Trinidad** the main objective in the breeding of pigeon peas has been to select and cross for an early

maturing dwarf type for close spacing. Dr R. P. Ariyanayagam, of Sri Lanka, was recruited as plant breeder in December 1973 and he has been working with 200 varieties, some of which were introduced from India, Australia and the Sudan. A physiological study, tracing the plant's typical growth and development pattern, has been completed and this produced records of a low Harvest Index (the ratio of grain to total vegetative plant matter) of about 20 percent compared with as high as 70 percent with soybeans. This is a base from which improvements have to be made.

In **India** more than 4000 varieties of pigeon pea have been collected at ICRISAT headquarters in Hyderabad, and are being crossed and tested (through cooperation with five other agricultural stations) in a wide range of latitudes and altitudes. Two crops are being grown each year, and samples of the most promising progeny of the many crosses made are being supplied to legume breeders in 10 other countries. The ICRISAT program is concentrating on breeding for resistance to wilt and insect damage, which are the main limiting factors in preventing higher yields in India. Measurements of cooking time are being made, a very important factor where food supplies are limited and difficult to obtain.

The collection of chick-pea varieties at ICRISAT is even larger: it numbers more than 9000 lines collected from 32 countries. A small army of local villagers has been trained in the technique of hand-crossing selected varieties for planting in the 18 hectares set aside for chick-pea at Hyderabad; other off-season nurseries have been established in **Lebanon**



of how to protect and transport food crops from the fields to the needy consumers. This can involve both taking crops from regions of abundance to those of scarcity, and preserving crops from seasons of abundance to those of scarcity.

The Centre sponsored two studies into this problem, in order to identify the weakest links in the chain of threshing, drying, storage, processing, transportation and marketing. One team under Dr Dante de Padua of the University of the Philippines studied the shortcomings in post-harvest rice technology in four countries of Southeast Asia, and as a result a number of projects are beginning to take shape in Indonesia, Thailand, Singapore and elsewhere. Also in 1974 a mission from the University of Alberta spent five weeks analyzing the food grains industry in semi-arid Africa, studying particularly the systems in Senegal, Nigeria, Ethiopia, Kenya and Tanzania. The topic was given prominence at the Commonwealth Ministerial Meeting on Food Production and Rural Development in March 1975, when J. H. Hulse, Director of the



and North India, in order to grow two crops a year and accelerate research. Work has also begun on selecting varieties on the basis of cooking qualities.

The ALAD program is many-sided. It is primarily aimed at improving the yields of three crops: chick-peas, broad beans (which is a particularly important food in **Egypt**) and lentils. It has involved collection trips, the most dramatic being a five-week expedition to **Afghanistan**. After screening this germplasm collection, a group of 168 chick-pea entries was sent for evaluation to a dozen countries of North Africa and West Asia in 1974, and the same procedure will be followed with the other crops in 1975. IDRC has contributed to this regional cooperation further by financing a training program for young plant scientists to spend a growing season in **Lebanon**, and return home with varieties they themselves have selected for further breeding. In 1974-75 the ALAD food legume training course brought 16 plant scientists from 10 countries to Lebanon for a five-month stay.

Another IDRC initiative in grain legume research has been the support of tests, under ALAD auspices in Lebanon and Egypt, of chemical compounds that can cause the parasitic weed orobanche (or broomrape) to germinate prematurely in the laboratory. Normally orobanche seeds lie dormant in soil until stimulated by chemicals exuding from a host plant such as lentils and broad beans, which the orobanche weed then proceeds to infest. The development of these "synthetic dormancy breakers" has taken place at the University of Sussex during IDRC-supported research on a chemical means to control striga, a weed that lives

off sorghum; fortunately, the compounds developed in the striga research appear from laboratory tests to be even more potent in stimulating orobanche to germinate. At present, there are difficulties to overcome in the application of germinators in soil. The next stage are field trials at Giza and in Lebanon.

A further contribution to the grain legume network has been the IDRC grant of \$222,500 to the International Institute of Tropical Agriculture (IITA) in Nigeria to help meet the first three years' costs of setting up a grain legumes information centre where documentation will be gathered on cowpeas, the minor groundnut species and various beans.





Agriculture, Food and Nutrition Sciences Division, presented a paper on the subject.

It seems likely that a great deal more work of methodical research into improving post-production systems will start in many tropical countries during the next few years. The Indian Council of Agricultural Research, for example, is coordinating a study being undertaken by five institutes to improve post-harvest systems for a variety of food crops and in a wide range of climates in India. Teams of agricultural

engineers will be working with small farmers to test and adapt different kinds of threshers, dryers, dehul-  
lers, cleaners, milling and other processing equipment. IDRC is contributing \$360,000 to this particular study over a three-year period.

Meanwhile, the pilot grain mill set up at Maiduguri in northeast Nigeria (which was described in some detail in last year's annual report) has produced results sufficiently encouraging for the Government of Nigeria to decide to set up 15 similar mills across

## Aquaculture – it's all a question of breeding

At present only about eight percent of the world's fish production is derived from aquaculture. But as a plateau is reached in capture fisheries of about 68 million metric tons a year and warnings become clearer that many of the most valuable wild stocks (such as herring) are being over-fished, more attention is being paid to aquaculture, or fish-farming. This is particularly true of Southeast Asia where already 4 million tons of fish and fish products are raised each year through aquaculture. They range from milkfish and mullet bred in coastal waters; shrimps, prawns and oysters cultivated by various means; to carp and other native fish raised in inland waters. The question has been how to increase this production many times over.

IDRC's involvement began with the sponsoring in April 1973 of a seminar at Malacca in Malaysia, where representatives of 11 Southeast Asian countries stated their priorities and needs. From this seminar began to flow proposals for projects. By 1975 the Centre had moved to support research in the breeding of carp in West Malaysia and India, in milkfish in the Philippines, and in oysterculture in Sabah (East Malaysia). Since the last two projects were only starting in mid-1975, the rest of this section is devoted to a description of work done collaboratively in British Columbia and Malaysia on research into the induced spawning of grass carp.

The shortage of fish seed supplies was a problem pinpointed at the Malacca seminar. This has been a particular problem with Indian and Chinese carp, which will normally only deposit eggs within their natural spawning grounds and only at certain seasons. Malaysia, moving to increase fishpond production of carp, faced a grave shortage of seed and was continually having to import fish fry at heavy cost in foreign exchange.

In British Columbia scientists of the Fisheries and Marine Service of Environment Canada had prepared gonadotropin, a hormonal extract from the pituitary glands of salmon taken when spawning. This gonadotropin was to be injected into female and male carp, when the female was ripe for spawning, to induce her to lay her vast numbers of eggs (and the male to

fertilize them) in controlled conditions where few would be lost.

Late in 1973 thousands of salmon were taken from Spring Creek in Washington state, from a spawning channel on Vancouver Island and from the cannery in Vancouver. While the salmon went to the canneries, the pituitary glands (weighing about 60 milligrams each) were removed and turned into a purified extract after being placed in a "fraction collector" machine to separate the gonadotropin. The final product of the glands of 10,000 salmon was a white freeze-dried powder filling three small vials. In all, about 18 grams were prepared for spawning experiments in Malaysia, enough (it is thought) to inject into 500 large carp.

In further research in Vancouver early in 1975, experiments were carried out to measure the effectiveness of the gonadotropin after storage in tropical conditions. Day-old chicks were injected with tiny amounts of gonadotropin, (which had been either kept absolutely dry or stored in varying degrees of humidity, and temperature) were later dissected to measure the growth of their gonads. Goldfish were similarly treated to test for ovulation.

In Malaysia the research station at Malacca has some of the best facilities in Asia, with fishponds and well-equipped laboratories. A major need during 1974 has been to give further training to the young staff of researchers. Studies on the improved nutrition of the carp being used for spawning experiments are necessary. A consultant from the University of Guelph visited Malacca in January 1975 to advise on nutrition, and Dr. H. Chaudhuri of India's Central Inland Fisheries Research Institute and coordinator of the IDRC assisted project in India which works on composite culture of carp, also spent a month in Malaysia as an adviser. He brought encouraging word of having stocked ponds in West Bengal with six compatible species of carp and other fish, and having harvested as much as 10,000 kilograms per hectare. Two Canadian advisers, an endocrinologist and a nutritionist, have been posted to the three-year project, which is expected to get fully under way during 1975.





the country. Research backing up the Nigerian project is under way at the Prairie Regional Laboratory in Saskatoon and at the College of Home Economics of the University of Saskatchewan, and principles developed at Maiduguri are being applied for small-scale processing industries in Lebanon and other countries in that region.

### Animal Science

The Centre has supported for some time research into converting energy, that was normally unused from cash crops, into animal protein. A first project of this sort was the work being done in Guatemala to develop economic rations for cattle and swine based on the use of high levels of coffee pulp. It was followed in 1974 by work undertaken in six institutes in Mexico on processing sugar cane as feed for both beef and dairy cattle. Pioneering work has been done in Cuba and Barbados on the utilization of sugar cane as cattle feed; the Mexican scientists will carry further the work on technical questions of processing, and also do a special study of the social and economic implications of this change in sugar cane utilization.

Most of the cassava research supported by the Centre, both at the International Centre for Tropical Agriculture (CIAT) in Colombia and in the network of projects that now extend across Africa and Asia, is concerned with improvement of this starchy rootcrop as animal feed rather than as human food. During 1974 the Centre published a booklet *Current Trends in Cassava Research* (IDRC-036e) in which Barry Nestel, associate director for animal science, summarizes the great amount of research now being done on this crop. Since it was published, other institutes have joined the network with major projects: among them Khon Kaen University in northeast Thailand and the Malaysian Agricultural Research and Development Institute (MARDI).

Work on animal diseases has centred on East Africa where trypanosomiasis, the parasitic disease transmit-

ted by the tsetse fly, is a major scourge among cattle. It has been estimated that 4 million square miles of potential grazing land in Africa is covered with tsetse fly, which excludes the use of improved breeds of cattle. Most previous research on trypanosomiasis has emphasized applied solutions, such as pesticides, rather than a comprehensive understanding of the basic relationship between animal and disease characteristics which would indicate the type of control methods, drugs or vaccines, that would offer the best hopes of success. During 1974 the Centre began putting substantial funds, therefore, into biological and immunological research. Part of the more basic research work is being done at the University of Guelph in Canada, but the main research is in Kenya where a strong project team has been gathered.

### Forestry and Fisheries

These two separate sectors are grouped here under one heading to emphasize that the Centre's main concern in both cases is research that can increase the livelihood of rural communities, rather than improve the profits of large industries. As well, during 1974-75 the forestry research supported with IDRC funds tended to emphasize the use of plantations to reclaim land for food production.

The description, carried elsewhere in this booklet, of two earlier forestry projects shows only secondary concern for encouraging food production. Later projects that were approved during 1974-75 put this as the central concern. These projects include land reclamation in the Sudan and plantations in Nigeria, where lines of trees will serve as windbreaks or shelterbelts to protect agricultural crops on irrigated and rainfed lands. In Kenya a different approach is being taken: there the research is designed to find species that will grow well on marginal soils and provide enough timber resources for the country so that high rainfall areas at present under forest plantation can by stages be released for agricultural production.

In the fisheries sector, the weight of IDRC support has been placed behind research into aquaculture (or fish husbandry) rather than into improving methods of fish capture and processing. The only project in the latter category is one among coastal fishermen in Ghana. Another section in this review describes the aquaculture network that is taking shape in Southeast Asia, and in particular the collaborative work between British Columbia and Malaysia on the induced breeding of carp. Elsewhere, the work on improving the culture of oysters (a food eaten by local villagers, rather than exported to luxury markets) in the coastal waters of Sierra Leone progressed well during 1974-75.

### Social Science and other Research

So far, this section has dealt almost entirely with research that is being carried out by the physical scientists. It is also important to mention the role of



social scientists and information scientists. The study of social and economic implications of agricultural research, and the methodical organization of agricultural information, are elements that the Centre has done its best to promote.

A major project in this area that neared completion in 1974-75 was the study of the impact, in social and economic terms, of the changes in rice farming that had followed the introduction of high-yielding varieties. The study, carried out through the International Rice Research Institute and a number of Asian institutions, covered 36 villages (more precisely, 2,428 rice farms) in 14 separate areas of six Asian countries. The findings will have the effect of modifying the more extreme interpretations that have circulated on the effects of the "green revolution": they show, for instance, that both family and hired labour actually increased despite the adoption of tractors on several study sites. The research has been edited into a book by Celia Castillo and Randolph Barker, to be published in 1975.

Other social science projects in support of agriculture and rural development include a study in Senegal of how changes in the land tenure law and the establishment of rural community councils have affected agricultural production; and studies in Sri Lanka and eastern Nigeria of how well rural communities and local governments are equipped to react to new technologies and modernization. All three studies advanced during 1974-75.

There was considerable progress in the enormous task of putting into operation, under the auspices of the Food and Agriculture Organization, the international agricultural information system known as AGRIS. The Centre not only contributed \$30,000 to the costs of central processing of the AGRIS file, but also helped establish through a contribution of a further \$125,000 to a small FAO unit in Vienna that accepts input from developing countries on worksheets or paper tape, rather than the magnetic tape required by the AGRIS central processor. The unit is converting this material to magnetic tape, and thus helping the developing countries play the fullest possible part in the system from earliest days. On a regional basis, the Centre helped Latin America to participate in the system by contributing \$250,000 to the setting up of a regional centre at the Inter-American Institute for Agricultural Sciences in Costa Rica where Latin American documents are being gathered and a Spanish-language bibliography is being produced. There has also been support for the setting up of an Agricultural Information Bank for Asia, and the preparatory work on this has resulted in linking the Philippines into the AGRIS system.

The FAO put AGRIS into regular operation early in 1975, and a bibliography of the output, known as *Agrindex*, is now being published monthly.

At a different level of information collection and dissemination, the Centre helped during 1974-75 to add to the number of specialized agricultural information centres. The first among these had been the cassava information centre at CIAT in Colombia. During 1974-75 two others were established: the grain legumes centre at IITA in Nigeria, mentioned elsewhere, and a centre for information on irrigation science and technology in Israel. These centres vary in sophistication. However, they will all collect the literature on their subject, produce bibliographies, perform specific literature searches on demand and operate question-and-answer services anywhere in

## Forestry – trees for people

The long drought in Sahelian Africa has left the people of the region more conscious than ever of their need for healthy forest plantations and woodlots — at a time when this resource has been dangerously reduced. The drought itself destroyed many trees; but, even before those years, the growth of human population had put heavy demands on the forests for firewood, while their herds of livestock in greater numbers than before damaged or ate many young trees.

Two projects of forestry research which began in 1973 in Senegal and Niger were designed to help restore and improve this resource. The first is concerned with improving the quality of gum arabic, the product of acacia trees that has many uses as a stabilizer or thickener in foods, pharmaceuticals and paints. The second is an attempt to establish woodlots near villages so that the women can find fuel for cooking without either spending hours walking long distances for firewood or else burning up millet stalks and animal dung which could better be used as fertilizer on the fields.

The main work on gum arabic is taking place at M'Bidi in northern Senegal, which has been a centre for this export trade for many years. Acacia seeds have been collected from three other countries besides Senegal which have been traditional exporters of gum arabic — Niger, Chad and the Sudan — because it is hoped that the research into improving the species of *Acacia senegal* and *Acacia laeta*, which is being undertaken with the assistance of the IDRC technical adviser Daniel Robert, will be of benefit to the whole line of countries which verge on the Sahara. The seedlings were grown in nurseries for five months before being planted out over some 16 hectares in August-September 1974. The planting season, which has to follow the first rains, is short; and a large effort is being made in 1975 to plant out 34 more hectares in order to reach the agreed figure of 25 hectares a year. In any case, the 9,500 trees planted out in 1974 have nearly all survived healthily; and the plantation has, after some delay, been enclosed with barbed wire as well as thorn tree



the world. The International Irrigation Information Centre has already begun commissioning state-of-the-art reviews, and also has a heavy emphasis on equipment specifications and performance.

The IDRC publications program has been particularly active in producing booklets and volumes related to agricultural research. A full list of publications during 1974-75 is given later in this booklet. Particular mention might be made here of the Centre's first hardcover book, *Nutritive Value of Triticale Protein* by J. H. Hulse and Evangeline Laing.

branches to keep away animals that would damage the young trees.

A vegetable garden has been started inside the enclosure at M'Bidi which can serve to provide nearby villagers with fresh vegetables through the year. The villagers are semi-nomadic, moving to the Senegal river at certain seasons. If the acacia plantations are successfully established and provide gum arabic in regular enough supplies and steady enough quality to compete with synthetics in the industrialized countries and find new markets in other developing countries, the production will create an important source of income for these herdsmen-villagers. Proving that vegetables can also be grown in this district will encourage the villagers to expand the areas under plantation and cultivation.

A start to the woodlots experiment was made in the Zinder region of south-central Niger in July 1974, when some 18,000 trees were planted on parcels of land near six villages in Matameye district. Since this was to be a community project, a good deal of preliminary discussion took place between foresters,

rural animation teams and villagers to make sure the villagers wanted to participate and could agree on what land should be used. Village headmen have subsequently said they are happy with the project and want to put more land under trees, such as neem and cassia, which have been planted in these lots.

Some 10 hectares were planted during the first year, and the original proposal foresaw 150 hectares being planted to woodlots during the five-year project. Much, therefore, remains to be done both in further planting, in training of forestry staff and in the full involvement of villagers in keeping the woodlots weeded and well protected from animals.

The government of President Seyni Kountche took power during 1974, and it is encouraging to see the strong emphasis that the new government is placing upon achieving advances in rural development throughout Niger. Results from forestry work come necessarily slowly, but this scheme has all the official encouragement that could be expected.





1974  
1975

## Modernization and Change

As is clear from the two previous sections, on People and Health and on Food Production, the Centre is strongly committed to improving the welfare of people living in rural areas. A commitment of this sort involves an acceptance of the need for change and modernization in the best sense. What is of course more important is that the people themselves must be convinced of the need for change — and, whenever possible, must be able to identify alternative ways of change, so that their policy-makers can set about choosing the way that is most appropriate, or least disturbing, to culture and society. This section, therefore, will concentrate on the support that the Centre has been giving to research designed to ease the process of modernization and change, and to offer developing countries the widest choice of alternatives.

The boundaries of this work are less clearly defined than research in agriculture or health care, or even

population dynamics. Some projects are closely related to food production and rural development (such as the land tenure study in Senegal, mentioned in the last section). Others in sectors such as the movement of people from countryside to cities may have an important indirect impact on the “sending areas” (i.e. the countryside), even though the immediate concern is to improve the situation of the migrants who have arrived in the cities.

A project of this sort is the study of low-cost housing needs in eight Asian countries, which is described on page 22. Another is a study of the role that the hawkers and vendors of cheap goods and cooked foods play in the economy of six cities in the Philippines, Indonesia and Malaysia. This study, which has raised an unusual amount of attention in Canada as well as Asia, is now complete. As well as the country reports and a comparative study, a general booklet and a slide-presentation have been prepared for a conference of mayors and city administrators in Kuala Lumpur, Malaysia, in September, when municipal authorities will discuss with researchers a set of recommendations to improve the conditions of these street traders and their working relationships with authorities.

A major reason for the movement of young people, in family groups or singly, from the countryside to town has been to seek better opportunities of schooling. To gain even a full primary education meant being better equipped to face the challenges of change. What are the chances that primary education can be delivered effectively in rural areas to the increasing number of children there? The answer heard from parts of Asia is: “The chances are not high, so long as the total cost of teachers’ salaries is disproportionate to the number of students being taught”. In response to this view, the Centre has supported in its program of applied social research an experiment in rural districts of Java and the central Philippines into ways to speed up the learning rates of students with self-instructional mod-





ules, and to alter the ratio of teachers to students. The first year of experiment with students of Grade 4 level has been encouraging, although according to some researchers that particular level is an awkward age for transition from a local language to a national or international language. The project teams are producing modules for other levels, and working out ways in which parents and the community can participate more actively. In the Philippines, links are being made with another experimental system known as In School Off School.

Another project of applied social research supported by IDRC in the field of the economics of education began in Latin America in 1974-75. This is an ambitious study, involving 18 institutions throughout Latin America and costing nearly \$3 million, into the relations between education and the economic and social development of these countries. The IDRC contribution of \$125,000 is supporting pilot studies in urban and rural areas, to assess the importance of

education in finding employment, distributing income and prompting migration.

Two noteworthy publications in the field of education were sponsored by the Centre in 1974-75. The first was *Whilst Time is Burning*, a description and personal assessment of a variety of innovative ideas in education gathered in his wide travels by J. Roby Kidd, of the Ontario Institute for Studies in Education. The other was a booklet, *Study-Service — a Survey* by Diana Fussell and Andrew Quarmby. This was prepared as a working-paper for a conference in Asia of educationalists and leaders of study-service programs, a term coined to describe the broad movement to involve university students, the young élite in developing countries, in a period of rural development work as an integral part of their education. Interest in this movement has spread from Asia and eastern Africa to West Africa, the Caribbean and Latin America. Although this type of program falls largely outside the Centre's main concern in educational





research — the effective delivery of mass primary education — it has a close relationship to the improvement of life in rural communities. The Centre has, therefore, contributed \$492,360 to a collaborative analysis, in six countries where varying kinds of study-service programs have been pioneered, of the impact of these programs and the best structural arrangements to allow small pilot projects to grow into national programs.

The process of modernization and change is affected

by a range of decisions taken by policy-makers in developing countries on how they intend to use modern technologies to fit the development objectives of their particular countries, and on what sort of science and technology program can make best use of the talents of their own trained people. Again, it becomes a matter of seeking to identify alternatives and (going back one further stage) of providing information to policy-makers about where alternatives can be found. This information allows the policy-makers to be selective about what parts of the technology

## Low-cost housing – study seeks solutions to city overcrowding problems

Migration from countryside to cities and continued high population growth rates in urban areas have put many strains upon urban services. A chief problem has been the shortage of housing for lower income groups. The problem is as acute in Latin America as in Asia, as was made clear in the general study of rural-urban migration to eight metropolitan cities which the Centre supported in 1971-73. A project focussing upon the housing problem in Southeast Asian cities began in 1973 as a collaborative effort among institutions in eight countries. A similar study undertaken in seven Latin American countries began towards the end of 1974.

In the Southeast Asian project, the main emphasis has been upon individual country studies. This is partly because the eight countries were at very different stages of handling the problem: Laos, for instance, was just beginning to face the issue of postwar resettlement and housing, while Singapore and Hong Kong are far advanced in their specialized programs of highrise construction. Even so, for all eight countries it was a first analysis of their experience in everything from the financing and physical design of low-cost housing to estate administration. By April 1975 the country monographs were all in final form, and will soon be disseminated not only in English but in several national languages (Indonesian, Sinhala and Thai, for example). The monographs pay strong attention to questions of land policies and program management, but deal also with a range of issues from the social aspects of housing to the cost of sewage treatment. The Philippine study includes a projection of housing needs to the year 2000. Decision-makers, administrators and scholars combined in these country teams to a point where there is every hope that there will be the least possible delay in translating many of the recommendations into policy decisions.

At the regional level, the country project coordinators and deputies have met four times to compare the results of their individual studies and look for common lessons. Papers on comparative aspects of housing have been prepared. These nine aspects comprise: housing conditions and housing needs; housing finance; the economic and social impact of

housing; housing administration; planning and design for low-cost housing; locational aspects of housing development; land policies; squatter area and slum development programs; and rural housing. The papers will be edited into a book later in 1975.

Beyond these studies, writings and policy decisions lies a broad benefit from building a network among the eight countries. Stephen Yeh, coordinator of the whole project, has called this process the creation of "solidarity and esprit de corps that is useful for future cooperation". Radinal Mochtar, of Indonesia, has said the project has created "continuity of contact between the real executives in each country". He thought these links would endure long beyond the lifetime of the project.





“package” can be manufactured locally, to the greatest benefit of their own people, and what parts need to be imported. A separate section gives some details of the program supported by IDRC to provide information to policy-makers on these subjects.

Moving from the offices of policy-makers to the factory floor (or even the small industry in a side-street), the Centre has been concerned to strengthen the flow of information that can improve the management and operation of medium- and small-scale industries. Technonet Asia, a network linking industrial extension services in eight countries to a coordination centre in Singapore and to sources of specialist information in Canada and elsewhere, was IDRC's first venture in this field. During 1974-75 the foundations for cooperation between the participating institutions were consolidated at the Technonet Council meeting, held in October, and the agreed program emphasized the training of extension engineers. A newsletter, published in Singapore every three months, provides a regular link between the organizations. Another venture in the same field was taken with the support for the establishment of an Industrial Technical Information Service in Bolivia. This service, run by a unit in the Ministry of Industry, Commerce and Tourism, will provide coordination for some 1000 small-scale and medium-scale industries in La Paz, produce a technical newsletter and operate a question-and-answer service. It is seen as a step towards participation in wider regional services in the Andean region.

This review cannot end without mention of two other large programs. The first is the Centre's part in promoting the creation of DEVSIS, a worldwide system designed to collect and disseminate information about projects and programs of economic and social development by the same type of structure and means as AGRIS works in the field of agricultural knowledge. The IDRC has not only seconded senior staff to the team which is defining a central operational structure for DEVSIS in Geneva, but has also contributed to institutions in Latin America and Asia which are being developed as potential regional centres for this system.

The second is the Human Resources program of awards to scientists and younger scholars in both Canada and developing countries. This program has grown year by year in numbers as new categories of awards have been added to fit the purpose of broadening the base in Canada of people with a balance of scholarship and practical experience in the problems of development, and the companion purpose of providing opportunities for professionals in developing countries. A special effort is made, during the design of any project supported by the Centre, whether in agriculture or health or social science research, to make sure that young scientists of the region benefit in training and experience as a result of the project. Other training programs are also supported by the Centre. The IDRC's own Human Resources program is intended to be complementary to these other efforts, and be flexible enough to fill gaps in training needs as they become visible. Details of the names of those Canadians and non-Canadians recommended for awards in the period under review are given in the annual report.



## Technology – the best of both worlds

The first research project of the science and technology policy program was the study undertaken by the Junta of the Andean Pact Commission, in order to support the formulation of a regional science and technology policy for the six countries. A description of this project, when it was still in progress, was included in the 1972-73 IDRC annual report.

The research team, under Dr Constantine Vaitsos, studied the experiences of a variety of countries in the use of such financial instruments as tax and credit policies for stimulating technological development, and other policies for encouraging innovation in particular industrial sectors. They studied, for example, the pharmaceutical industry in Italy and the copper industry in Yugoslavia, and the factors affecting the selection of labor-intensive technology in the Indian electronics industry.

Some common characteristics emerged. Technology tended to be transferred in package form, and it was standard policy for these importing countries to "disaggregate" the package into the parts which could be manufactured locally and those for which importation would have to continue. By separating the elements of a technology package, a country could also begin to understand and improve the imported parts of the technology. The Japanese, it was noted, had become exporters of technology by disassembling plants and machines, improving their design and operation, and then selling this technology to other countries. A second common characteristic was that these countries had learnt to reduce the cost of importing technology by searching international markets for alternative suppliers of technology.

In 1973 the Junta presented to the Commission of the Andean Pact (the policy-making body of the Andean Common Market) a document entitled "Bases for a Sub-Regional Policy on Technological Development". Decision 84 of the Commission, a regional science and technology policy, was adopted in June 1974 and was based on the team's research efforts. A second decision, concerning industrial property legislation, was also passed. The regional policy statement notes that research is only one activity in a government's science and technology program, and that the building up of support services (such as training schemes and information systems) is an essential part of putting any program into practice.

The "Summary of the Studies on Technology Policy" and the document, referred to above, on which the Commission based its policy decisions are being published during 1975 in Spanish and English versions.

From this original project have stemmed two other

projects in the Andean region. One of the detailed studies undertaken inside the region during 1971-73 was concerned with the commercial utilization of the tropical rain forests; this was done with the help of two Canadian forestry experts who were provided under a CIDA contract. As a result of this work, the Commission has launched a study of the technological properties of about 100 species of timber to be found in the Andean forests. Testing of these species is being done in laboratories in Peru, Ecuador, Colombia and Venezuela. The objective of this research is the more efficient use of forest resources in the housing and furniture industry, and increased job opportunities in the saw-milling and lumbering sectors. In March 1975, the Centre made a \$988,420 commitment to this project — the largest forestry venture it has so far supported — while the Andean countries contributed the equivalent of \$735,350.

Another grant, to the Junta of the Andean Pact Commission, is to help continue until mid-1976 the work on a strategy for industrial development begun in the original project and summarized above. At this stage, the team under Dr Vaitsos is concentrating on detailed studies of the specific technological requirements of particular sectors. These include agribusiness, the petro-chemical industry, the automotive industry and low-cost housing.

Another significant project is being undertaken by participants in a 10-country network which is assessing the different policy instruments available for implementing science and technology policies. Six institutions in this network are from Latin America (Argentina, Brazil, Colombia, Mexico, Peru and Venezuela) and they are working with others in Egypt, India, Macedonia and South Korea. A project field coordinator, Dr Francisco Sagasti of Peru, assists the teams with the common methodological aspects of the research and coordinates the international, comparative aspects of it. A coordinating committee composed of the country project directors and Dr Sagasti meets twice a year to review the progress of the research and decide policy matters. The third such meeting, held at the mid-point of the project, took place in Cairo in November 1974.

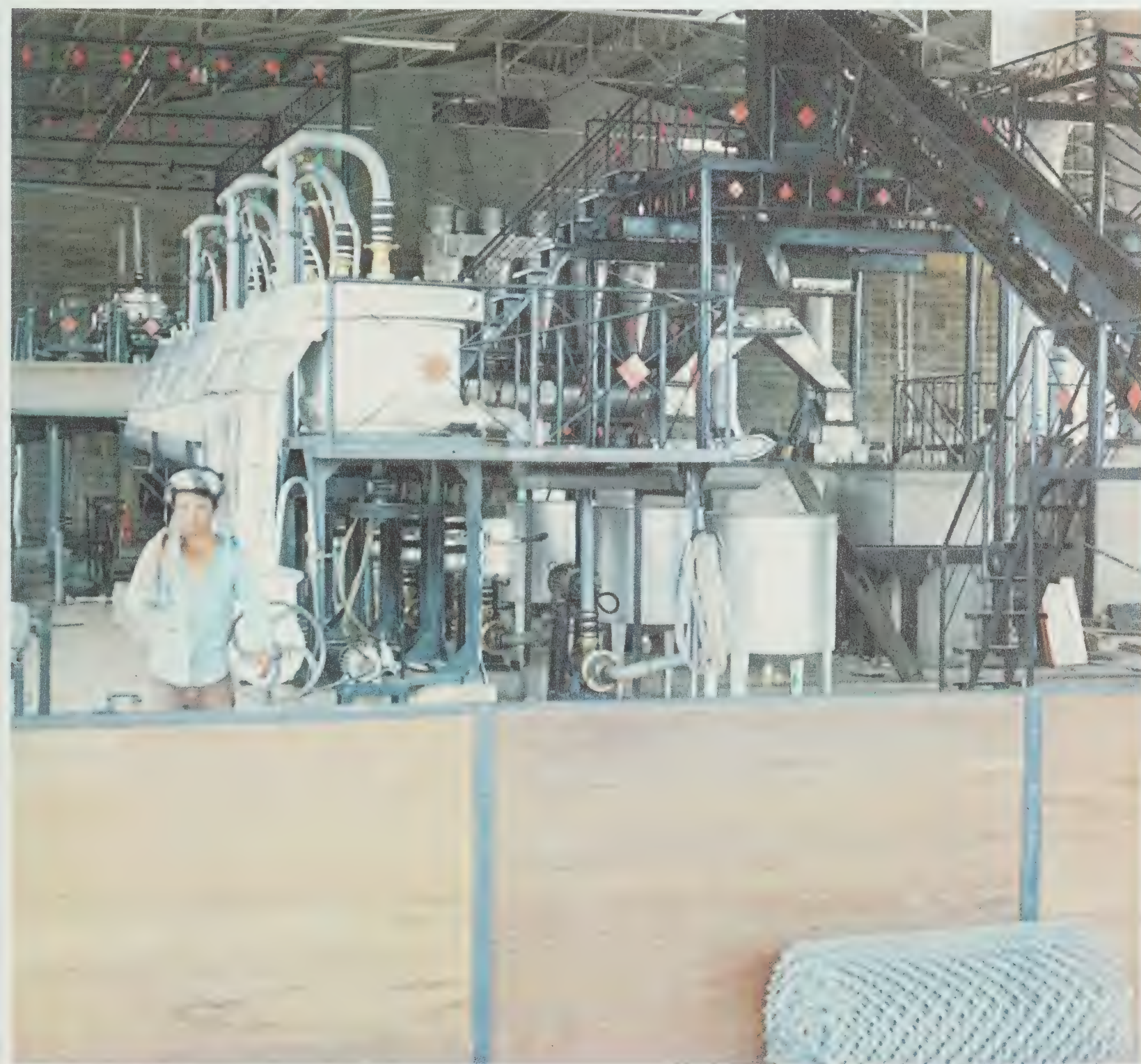
The research in each country is divided into four phases. First, a general diagnosis of the present state of science and technology in each country, to assess the effectiveness of existing policy instruments. Second, an examination of the government's role in the formulation and implementation of science and technology policies, both by direct and indirect policy-making. Third, a series of empirical studies to test the effectiveness of alternative mechanisms and instruments, including mechanisms to provide a linkage between a productive unit's demand for



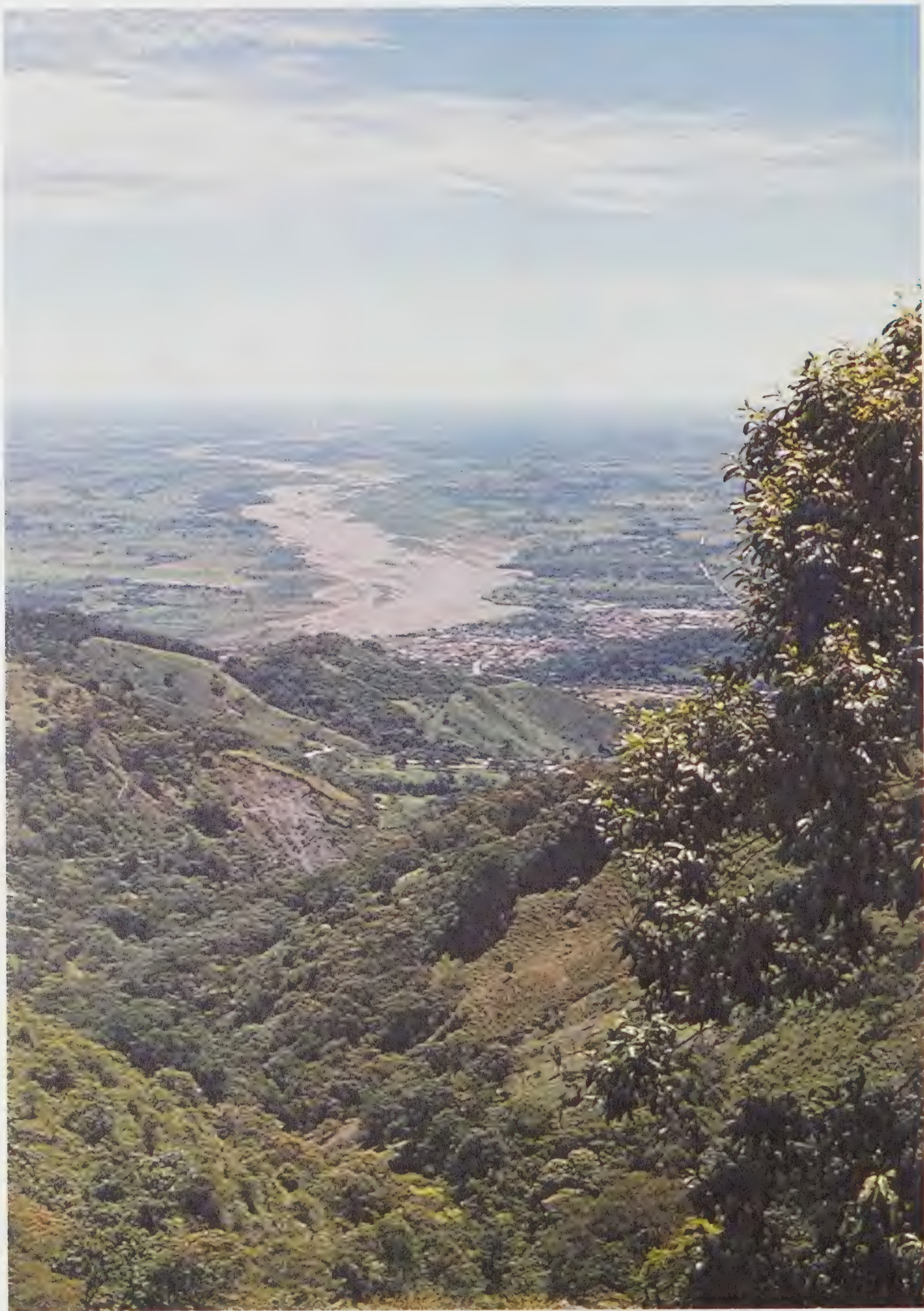
technology and the indigenous capability for producing it. Finally, studies of the effect that policies have on the behaviour of organizations and research institutes that produce scientific and technical knowledge.

Individual teams have been doing case studies of particular interest to their own countries: the South Korean group has investigated the metal processing industry, while the Brazilian researchers have been analysing state enterprises.

When the project is completed in July 1976, among the results will be not only 10 country reports to assist policy-makers in the individual countries, but also reports comparing four or five different industrial sectors studied by several teams, and consultants' studies commissioned by the coordinating committee on such topics as engineering design and the technology policy of China. These reports will represent an important contribution to the literature published on science and technology policy.











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(Bob Stanley, Editor-in-Chief)

Beginning with vol. 4, no. 1 *The IDRC Reports* has been produced in English only, with companion editions in French, *Le CRDI Explore*, and Spanish, *El CIID Informa*. In its new format the publication takes a more general "news-magazine" approach to the work of the Centre and related development topics, rather than relating each issue to a specific theme. Madeleine Vaillancourt Wagner has been responsible for the French edition; Susana Amaya Puerto, of the Latin America Regional Office in Bogota, is responsible for the Spanish edition; while the English edition, together with coordination and production, is in the hands of Bob Stanley, Editor-in-chief.

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Photos:

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# Interface

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# Interface

## IDRC Review 1975/76

**Interface:** "The place at which independent systems meet and act on or communicate with each other; an area in which diverse things interact."

— *Webster's New Collegiate Dictionary*

"Too often research programs in the Third World remain isolated from the mainstream of international research . . . .

I believe that in the next few years the Centre must give increasing attention to the dissemination of existing technologies and to strengthening the ability of national research organizations to adapt such technologies to meet the needs of their own development plans."

— *W. David Hopper, IDRC President*





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## Some basic facts about IDRC

### **When was the IDRC set up?**

The Centre was established by an Act of the Canadian Parliament assented to on 13 May 1970. The first meeting of the 21-member Board of Governors took place in October 1970.

### **Why was it set up?**

It was set up (in the words of the Act) “to initiate, encourage, support and conduct research into the problems of the developing regions of the world and into the means for applying and adapting scientific, technical and other knowledge to the economic and social advancement of those regions”.

It was established as a public corporation, to give it the greatest possible measure of flexibility and autonomy while still being accountable to Parliament. Its funds are in the form of “untied aid”, which allows it to secure the best available professional skill, and to finance projects in the most appropriate way, regardless of the origin of the research workers and the source of equipment.

It has placed heavy emphasis on support for research workers indigenous to the developing regions. The great majority of projects are being carried out in those regions, and all of them are under the direction of a scientist or administrator of that region. Research financed by the Centre in Canada, at universities and elsewhere, is undertaken in support of field projects in developing regions. This emphasis has been taken to fulfill the objective of the Centre, as stated in the Act, “to assist the developing regions to build up the research capabilities, the innovative skills and the institutions required to solve their problems”.

### **How much has been done?**

From October 1970 to March 1976 the Board approved support for 366 projects, which required appropriations of \$67.3 million. A few projects involve expenditures of more than \$1 million, while others involve less than \$5000; the average has been about \$200,000. Some 52 projects have been completed. Research has been taking place in some 75 different countries.

### **What are the principal sectors in which research has been supported?**

Research to improve food production and nutrition has been a foremost concern. Crop research in the semi-arid tropical regions was a starting-point for this agricultural research. Improvement of health care in rural communities, and an understanding of the many variables that influence couples in deciding the size of their families. An understanding of the processes of modernization and change, and of the social, economic, political and cultural consequences of change. Improvement of the means of collecting and disseminating information for and about development.

### **How international is IDRC?**

The Board of Governors consists of 11 Canadians and 10 non-Canadians. Six Governors are drawn from developing countries.

The centre has established five regional offices — in Singapore, Bogota, Dakar, Cairo and Nairobi — four of which are headed by nationals of the region. Some 83 members of the staff work in these regional offices or at other places outside Ottawa.

### **How does it fit in with the work of the Canadian International Development Agency?**

IDRC has been the managing agent for CIDA's two largest grants in agricultural research (in triticales development and cassava-swine research). Staff from each organization attend the other's project review committee meetings. In principle, IDRC supports the more innovative and risky research, and passes to CIDA proposals for larger-scale support of projects incorporating proven new technologies.



# Introduction



Looking back on the first five years of the International Development Research Centre, the dominant impression is one of growth. A total staff of over 300 around the world is not large by comparison with many other international organizations, but it is a far cry from the small group of two dozen or so under whose care the Centre began operations in 1970.

During the past year, however, the rate of staff growth has levelled off, and I expect that any future increase will be at a much reduced rate. Which is not to say that the Centre as it enters its second five-year period is in any way pulling back or slowing its pace. On the contrary, the year under review has been as exciting and stimulating as those that went before, and I am confident that in the years ahead the Centre will continue to expand its ability to provide the sort of expertise, encouragement and assistance for which it was created.

During the past 12 months the Board of Governors approved funding for 109 new projects, a total financial appropriation of \$23.5 million. This brings to 366 the number of projects undertaken by the Centre since its inception and raises the total amount of funds appropriated to \$67.3 million. Some 52 projects have now been completed, 14 of them during the past year.

The Agriculture, Food and Nutrition Sciences Division continues to reflect the Centre's emphasis on research in support of the rural peoples of the developing world with 44 new projects totalling \$10.9 million. The Social Sciences and Human Resources Division undertook 31 new projects costing \$5.5 million; the Population and Health Sciences Division 15 new projects for \$4.5 million; and the Information Sciences Division 17 new projects for \$2.3 million. The activities of the newly-formed Publications Division during its first full year of operation are covered elsewhere in this volume. A further \$1.9 million was committed during the year under review in support of 177 Division Activity Projects. These are activities such as seminars and workshops, and are usually preliminary to the undertaking of a full-scale project (for example, the Centre this year is supporting a two-year project seeking an appropriate potato processing technology for the lowland tropics — the project proposal was based on the recommendations of an IDRC-sponsored seminar the year before). Last but by no means least the Centre's Human Resources awards program, an investment in the training

and development of young professionals, made available grants totalling \$1,082,265 to 63 individuals committed to careers in the field of international development.

These are the bare statistics of the past year, and as such they tell only a small part of the story. The narrative that follows this brief introduction is an attempt to flesh out the figures, presenting a broad overview of the Centre's activities during the year.

During the past year a formal agreement was signed with the Government of Kenya enabling the establishment of the new IDRC Regional Office in Nairobi. Under the direction of Anthony Price, formerly director of the West African Regional Office in Dakar, the new office will be responsible for the Centre's relations with the developing nations of East and Central Africa, and is indicative of the Centre's increasing involvement in research on the African continent. The Centre's Regional Office for North Africa and the Middle East was moved temporarily from Beirut to Cairo at the end of the year as a result of the increasing difficulties of operating in the Lebanese capital.

On a personal note, I was honoured to be nominated as Canada's official candidate for the position of Director-General of the UN Food and Agricultural Organization, which became vacant at the end of 1975. The outcome of that election is now history: the delegates chose, not entirely unexpectedly, a candidate from a Third World country, and for my part I was delighted to be thus able to accept the Board of Governors' offer of a second five-year term as President of the Centre. At the outset of the campaign I stated that the FAO was perhaps the only post that could tempt me away from the Centre. Thus my reaction to placing second in the race was a mixture of both regret and relief.

The time spent on that campaign, however, was by no means wasted. The extensive travel it involved took me to many countries where I had the opportunity to renew old acquaintanceships and to strike some new ones, not to mention visiting many Centre-supported projects. Distilling the impressions of all those visits and discussions, I find both good omens and bad.

The positive news is that, more than ever before, I found government officials at all levels stressing the importance of indigenous research as a pre-condition for successful development programs. This heightened recognition of the importance of research by Third World decision-makers must be reflected in future Centre programs. Against this, however, must be set the singular weakness of national research programs in the Third World generally. Too often they remain isolated from the mainstream of international research and are woefully limited in facilities, manpower and resources needed to effectively screen and assess the applicability of new technologies.

Recognizing these two facts, I believe that in the next few years the Centre must give increasing attention to the dissemination of existing technologies — including the technologies of social management and administration — and to strengthening the ability of national research organizations to adapt such technologies to meet the needs of their own development plans.

It will not be easy. It will require a great deal of effort, experiment and innovation. But it will be both exciting and rewarding.

*W. David Hopper*  
*President*



## People Must Eat



*Triticale crop in Ethiopia.*

On 26 March 1976 the world's population was officially estimated to have passed the four billion mark. Four billion people with one thing in common: they all have to eat to survive.

During this same year the world's food reserves were estimated at a perilously low 31 days' supply. That means that in the event of a major worldwide drought resulting in large-scale crop failures, millions of people would starve — most of them in the Third World.

The World Food Conference in Rome two years ago called for a global reserve food supply of 10 million tons. To build such a stock, assuming it were possible, would cost in the region of \$40 billion or more. A similar amount would be needed to develop the vast food production potential of regions such as India's Ganges Plain or the Southern Sudan: projects that could double the world's food output.

These are the stark statistics of the world food problem. In the face of a problem of such magnitude and complexity it is evident that only a concerted effort on the part of both governments and other agencies can hope to bring about any lasting solution. On such a scale even the total resources of the IDRC appear insignificant.

Nevertheless the Centre does have a significant role to play in helping to feed the world's peoples — as a catalyst in bringing together governments, agencies and institutions to tackle specific research problems; as a source of both expertise and risk capital to support the scarce resources available to researchers in the Third World; and, equally important, as a disseminator of research findings.

The IDRC is one of the Consultative Group of some 30 donor agencies that supports a network of international agricultural research centres (IARCs). Their work is now a central factor in the activities of the Agriculture, Food and Nutrition Sciences Division: during the year ahead the IDRC will contribute approximately \$2 million to this network directly, and considerably more indirectly through national and regional programs linked in one way or another to the work of the IARCs.

In addition to playing a vital role in agricultural research, the international centres provide training programs for scientists from the less developed countries, and in this way they are a continual source not only of new

knowledge but also of new skills. Equally important, they are able to support, both directly and by example, the kind of regional and national research programs so urgently needed if the less developed countries are to become more self-sufficient in food.

Another way in which the IDRC plays an international role in agricultural research is through its support for agricultural information services. The main focus continues to be the FAO's International Information System for the Agricultural Sciences and Technology, known simply as AGRIS, which went into regular operation at the beginning of 1975. AGRIS collects bibliographies from national and regional centres and compiles them into a periodical bibliography of the world's agricultural literature. This collection network is already proving important in "capturing" valuable unpublished literature that had previously not been disseminated further than its institution of origin.

The IDRC has continued to assist regional centres in Latin America and Southeast Asia in developing regional networks for collecting data for AGRIS and providing output services to users in the regions. Computer techniques are gradually being introduced as the large numbers of documents require mechanized handling.

The input specifications for the central AGRIS processing by FAO proved to be too stringent for many developing countries lacking the necessary technology, and so the IDRC has assisted the FAO in setting up a special unit that converts material from these countries into machine-readable form which can be accepted by the AGRIS computer.

At another level, the IDRC is supporting specialized agricultural information centres that frequently provide the only comprehensive source of information on specific topics, such as particular crops. It is anticipated that these centres should eventually become part of the network of specialized services that will make up the AGRIS system.

One of the newest specialized information centres supported by the IDRC is the International Irrigation Information Centre (IIIC) in Israel, which began a two-year pilot operation in 1975. The objective of the Centre is to provide information on irrigation science, technology and equipment, and the use of irrigation on the farm. Through various media, such as an abstracts journal, a newsletter and a question-and-answer service it will reach a broad range of workers — from research scientists to civil engineers and agricultural extension officers. The centre will serve primarily the semi-arid regions, which include the Middle East, large parts of Africa and Latin America, most of India and parts of central Asia.

Increasing food production is not only a question to be dealt with by food and agricultural scientists — it also involves statisticians, managers, computer scientists, librarians . . . and social scientists.

In Senegal the National Centre for Agronomic Research established in the late 1960s several "experimental units". Each unit consists of several villages and surrounding farms, and each serves as a test area for the introduction of new farming techniques, experimental crops and agricultural technology.

Initially the introduction of new methods brought excellent results, but another limiting factor soon became apparent — land ownership. To obtain the maximum benefit from the improvements it would be necessary to reorganize much of the farmland, but to do so meant becoming entangled in a web of traditional and imposed land law. For the past two years the IDRC has been supporting a project in the experimental units aimed at untangling that web. So far the results have been promising, with fewer, larger, more regular



# Trees help to hold back the desert

Windbreaks are not new. For centuries farmers have planted trees to protect their farms. But now, as African and Arab states face the need to check the advance of deserts and to bring more land under food crops for their increasing populations, greater knowledge is urgently needed of the best species to plant in shelterbelts, as well as the best cultivation practices — spacing, cycle for replanting and so on.

As the Nile Valley becomes even more crowded, planners in Egypt hope to settle new communities in cities and on farmland to the west, in addition to filling in empty areas towards the Suez Canal. There is water in plenty to irrigate millions of acres, the major physical problem is that the wind blows from the west and carries sand that covers the land.

Dr Hosny El-Lakany, of the University of Alexandria's Forestry Department, has been concentrating on casuarina trees as most suitable for use in shelterbelts. Casuarina is a native of Australia and Southeast Asia, an evergreen that has the appearance of a pine but the properties of the broadleaved species that furnish hardwoods for wood-using industries. It has spread through the world's tropical and sub-tropical regions, and is already common in many parts of Egypt. Here the most promising species of *Casuarina equisetifolia*, which is resistant to termites and has the capacity to fix atmospheric nitrogen in root nodules, and thus will not compete with agricultural crops for soil nitrogen when growing in soils with low nitrogen content.

Farmers have already noted these qualities. In a village in the Thawra district along the desert road from Alexandria there are avenues of casuarina trees (of mixed species) planted in a grid. To the east, or leeward, smallholders who have moved from the Delta are harvesting good crops of corn,



*Farming beside casuarina shelterbelt in Egypt.*

beans and clover in the shelter of trees planted 12 years ago. There are hundreds of other such villages.

Dr Hosny has big ideas. He is planning a shelterbelt 50 metres deep running north-south for 30 kilometres. In front of the most westward line of casuarina will be planted acacia and shrubs that can break the force of the wind and take off much of the sand. At West Nubaria mechanical farm, an enterprise begun with Soviet help, his team has increased the nursery production of casuarina seedlings from about 50,000 to more than a million in a year.

While this first long shelterbelt may be planted in the next three years, he also has longer-term plans. Clonal seed orchards are to be established to produce seeds with improved characteristics. A close watch is being kept in different regions on some 200 especially good casuarina trees from which scions may be taken for these orchards. Dr Hosny is visiting Australia for three months to study some of the 40 or more casuarina species that have not yet spread to other lands. In the University of Alexandria's wood technology section, tests will be done on the fitness of casuarina for uses such as parquet flooring, fibreboard or furniture. To make shelterbelts more profitable, Dr Hosny also hopes to develop improved species that can reduce the growing cycle from 12 years to just seven.

fields providing for more efficient agriculture, increased yields and the introduction of new crops. In the process many long-standing disputes over land ownership have also been settled. As an example of agriculture and the social sciences working together, the land tenure project is being closely watched by a number of African countries faced with similar problems of land reform.

Reorganizing land is one way to increase food production, reclaiming land for agriculture is another. All over the world there are deserts and arid zones where once there was forest or farmland. Examples of “desertification” caused by man’s misuse of the land are to be found everywhere: in North and South America, in Asia, Africa and the Middle East. Once the vegetation has been destroyed — by over-grazing, perhaps, or by decimation of the forests — erosion takes place rapidly, and the arid lands advance. An added problem seen all too clearly in recent years in the Sub-Saharan savannah region of Africa, is that the people too must pull back, creating additional pressures on the remaining farming and grazing land.

Awareness of the dangers of this situation has grown in recent years, and as a result a cooperative regional network has been formulated that now encompasses 11 projects dealing with various aspects of savannah forestry, many of which are supported by the IDRC. In 1974 the Centre also sponsored a meeting of a Working Group on savannah forestry that established research priorities for the network.

The establishment of shelterbelts — long plantations of drought-resistant trees that help prevent further erosion of agricultural land — and village woodlots to provide not only shelter but badly needed firewood and building materials, are high on the list of priorities. An important forest product and export commodity for several of the countries in the savannah belt is gum arabic — used in the manufacture of many food, chemical and pharmaceutical products — and its increased production is another research priority. Other projects in this network deal with plantation forestry, wood utilization and preservation, and minor forest products.

Forest research is by its very nature a long-term process, and not one that yields immediate results. In the long run, however, the cooperative approach being taken by the governments of the region should do much to improve the environment and benefit the people of the five million square miles that make up the sub-Saharan region of Africa.

Similar problems are to be found in the semi-arid zones of the Middle East, where few tree species are at present capable of survival. In Egypt the IDRC is supporting a project to establish shelterbelts using the fast-growing *Casuarina*, a tree that originated in Australia (see box). In Jordan, where any kind of vegetation is sparse and forested areas represent less than one-half of one percent of the total land area, the IDRC this year began supporting a national afforestation program that aims at producing nine million seedlings annually within the next few years.

This three-year project will study new techniques for planting trees in desert areas by harvesting run-off water, and train local forestry officers in experimental methods with a view to providing more trained workers for an expanded future afforestation program.

Where more land is simply not available, it is also possible to increase production through the improvement of the plants themselves. In previous Annual Reports a good deal of space has been devoted to the development of new high-yielding cereal varieties and to the hybrid grain triticale developed at the International Maize and Wheat Improvement Centre in Mexico.



Breeding programs involving triticale, sorghum, millet, maize and the root crop cassava are on-going in Africa, Asia and Latin America, and a number of new projects were approved during the year. An important aspect of the introduction of a new grain such as triticale, or even an improved variety of a familiar one such as sorghum, is its acceptability to the consumer. For this reason a utilization component is often built into the program in order to ascertain the most practical and acceptable form in which to introduce the new grain into the home. This is the case with the on-going triticale utilization project in Ethiopia (see box).

There is one other means of making more food available in which the IDRC is becoming increasingly involved, and that is the prevention of waste. In many developing countries the rate of loss following the harvest can reach 30 percent or more — losses due to predators, inadequate storage and a host of other factors. The problem is a complex one, involving as it does harvesting, drying, storage, packaging, transportation, processing and utilization. And different approaches are required for different crops and products.

During the past year the Centre has committed its support to a number of projects in this important field of agricultural research. Three projects for research into rice postharvest technology are now underway in the Philippines and Thailand, and the Centre has also recently published a unique training manual on the subject. Projects concerned with postharvest technology research on sorghum and millet are underway in several African nations, and in Latin America crops under study include cassava and potatoes. The Centre will continue to support research into the development of postharvest systems and to encourage a coordinated international effort to tackle the problem of food loss.

Waste also occurs when parts of a plant are discarded once the desired products have been extracted. In Central America several on-going projects are attempting to reduce this loss by making use of the unwanted parts of the coffee and sugar plants as cattle feed. Two major problems have to be overcome: reducing the toxicity of the by-products, and processing them into a form that the cattle can accept in their diet. If the projects succeed the implications are obvious not only for sugar and coffee growers, but for a variety of crops where often the bulk of the plant is simply thrown away.

One more form of preventable waste can be seen in the under-utilization of land. In addition to the use of improved seed varieties mentioned earlier, there are two ways in which farmland can be made to produce more without detriment to the soil: by intercropping, or cultivating two or more crops simultaneously; or by planting a second crop (such as sorghum after rice) when the land would otherwise be lying fallow. Intercropping and the development of cropping systems are related areas in which the Centre has been supporting a number of projects, and during the past year additional support was committed for projects in Sri Lanka, Senegal and Tanzania.

Not all food, of course, is produced on land. The Centre continues to be involved in a number of aquaculture projects — another form of food production in which there is little waste, since the fish in ponds can be fed on waste vegetable and animal matter, even on waste fish. Three fisheries projects were approved during the year. In Sabah, Malaysia, a three-year project will identify potential areas for the development of oyster culture, improve production, processing and seed supply techniques and train local personnel for extension work. In Canada a system for the bulk collection of salmon pituitary glands used in tropical fish breeding is being developed. And

# Triticale helps to feed the children

The land in Indibir district, 150 kilometres southwest of Addis Ababa, is not thought good for farming. The rainfall at this altitude of about 2000 metres is fair, but the common pasture-land is overgrazed and the valley slopes eroded. The farmers keep oxen, to provide their families with occasional meat, but do not use them for ploughing. In hand-tilled plots near their houses where it can be fertilized (the land is deficient in phosphate), they grow a little wheat and barley; their basic food comes from the ensete, or "false banana", whose stem and upper root is cut and left for months to ferment and then pounded until it can be worked into a flat-cake known as kemuse. It is starchy food, and malnutrition shows in the bodies of the children. The Guragie people who live in this part of Shewa province are sometimes known as "the Germans of Ethiopia", industrious people whose menfolk migrate to the towns and set up as small businessmen to supplement the meagre income from family farms. There is little incentive to remain on the land.

When the program of triticale research was extended from Mexico and Manitoba to Ethiopia (as well as five other countries), the project leader Hailu Gebramariam was keen to interest farmers in Indibir district in this new cereal — and their wives in using it as an ingredient in traditional dishes to improve their nutritive value. Six families at Gura near Indibir agreed to cooperate.

At the Holetta research station above Addis, Hailu Gebramariam is experimenting with his own triticale hybrids — using wheats from Kenya as well as from Canada and Mexico, and triticale lines

from Hungary produced from winter wheat. To the farmers near Indibir he offered seeds from four established lines, and he also set up a demonstration plot of five hectares in the district to test more varieties in local conditions. A technical assistant, Getachew Kassaye, looks after the plot; but the Holetta team, including the nutrition assistant Maaza Kersi, visit Indibir regularly.

Walking round the farmers' plots, Hailu sees which of the four lines are doing well. In Ato Berga Sorballa's plot, as elsewhere, the best performer is Bacum, a Maya 2 cross. His wife, Bezunesh Fasha, has prepared kemuse made of one part triticale to three parts kocho (the product of ensete). At another house in the village Murgat Sefraga, wife of Imam Kedir, has increased the triticale proportion even more. The kemuse is light in the middle.

In an official report compiled by Maaza, the wives at Indibir said that triticale helped improve four local foods — debo, genfo, injera (although it made this favorite dish "slightly sticky") and kemuse. "It makes the colour, odour and texture of the kocho better," Bezunesh is reported as saying. To a visitor Ato Berga put it more graphically: "I've lived here 20 years, and was almost ready to leave and go some other place. But for the last two years with the new cereals I am able to feed my children properly". Imam Kedir added: "With ordinary kocho we get heartburn. It is much better with this mixture".

As the research continues, more villagers will be involved. But the families in Indibir, have given the program an encouraging start.

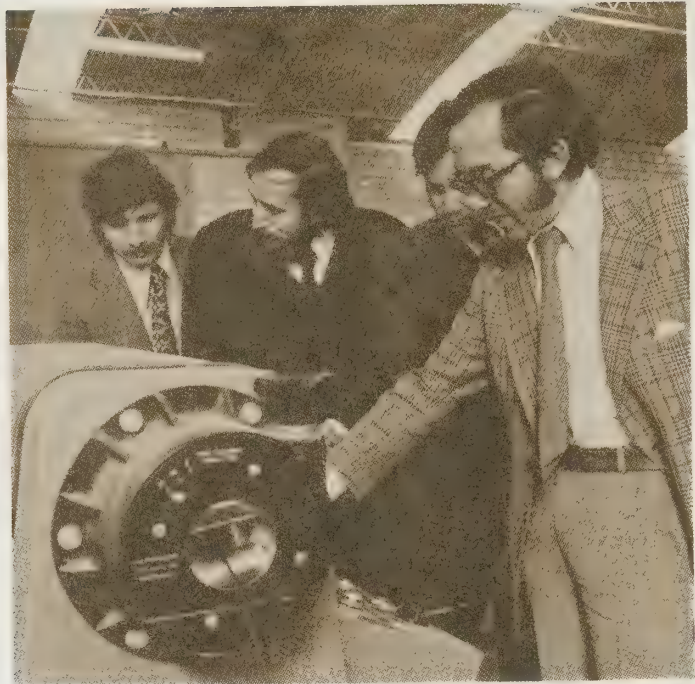
in the Philippines a two-year project is underway to develop cheap and efficient facilities for processing, packaging and storing fish products.

This has been a necessarily brief review of some of the Centre's activities during the past year that were in one way or another connected with food production. As can be seen, it is a concern that involves each of the Centre's program divisions to some extent, and in simple cash terms food production is easily the predominant activity of the Centre, accounting for better than 40 percent of its expenditures over the past five years.

As will be seen in the following sections, however, the Centre is also concerned with a wide range of other development activities.



## Satellites & Stained Glass Windows



*Studying imported technology in Latin America.*

The gap between the so-called developed countries and the developing countries is above all a technological gap. It remains that way because the majority of the countries in the Third World are virtually dependent on imported technology — machines and methods that are both complex and expensive, are not always appropriate and are often wasteful.

The technological gap applies not only to industry, but also to agriculture and food production, health services, sanitation, education and habitation. It affects both urban and rural peoples, and has a direct bearing on employment, on living standards, in fact on every aspect of life. Research into the development of new, appropriate technologies, and the transfer and adaptation of existing technologies, is therefore a vital part of the IDRC's role, and one that involves every program division.

One of the largest projects in this field — in fact one of the largest projects ever organized on this subject — has been the Science and Technology Policy Instruments project (STPI). The IDRC, in cooperation with the Organization of American States, has been supporting this project since 1973, and in the coming year will provide additional support for the dissemination of project results. Researchers in Argentina, Brazil, Colombia, Egypt, Korea, India, Peru, Venezuela and Yugoslavia are participating in the project, which is aimed primarily at finding the means to put policies into practice. Too often science and technology policies are made in a vacuum, unrelated to the realities that affect technological development, whether the technology is indigenous or imported.

This project — conceived, organized and carried out by Third World researchers — should help to develop and make better use of indigenous capabilities, and, where the importation of technology is essential, link such technology to indigenous activities, minimize its detrimental effects and maximize its beneficial effects. Above all it will provide the participants with the opportunity to link science and technology directly to national development goals.

A similar concern with the impact of imported technology is the basis for two regional projects in Latin America, where, although a great deal of technical hardware is imported, mainly from the US and Europe, little research has been done to ascertain how such hardware is acquired or how it is used.





*TECHNONET extension officers visit a small industrial plant in Manila, Philippines.*

Four countries — Brazil, Colombia, Mexico and Peru — are cooperating in the Management of Technology project, which focusses on the food industry, particularly products and processing. By studying individual firms the researchers from schools of business administration in the participating countries hope to learn more about the decision-making process within a firm as it relates to the choices and use of technology.

Colombia and Mexico are also participants in the Market for Technology project, which is studying the acquisition of imported technology. Three industries are being studied — synthetic fibres, food preservation and shirt manufacture — and the researchers are attempting to answer such questions as: who supplies the hardware, how is it purchased, how much information is available, how competitive is the market, and how do would-be purchasers evaluate the alternatives?

In Uruguay another project begun this year is making a study of the printing industry, which, according to the Association of Uruguayan Printers, is in a critical state. The Uruguay project aims to rationalize the purchase of equipment — often second-hand and always imported — and the development of skills in a vital national industry. The project is supported by the Association of Uruguayan Printers, which will also produce the final report.

At the International Potato Centre in Peru, the IDRC is supporting the search for an inexpensive low-energy technology for processing and preserving potatoes. The project has implications far beyond Latin America, since it is largely the problem of storage that has prevented potatoes from becoming widespread in the lowland tropical regions of the world, where they could provide a valuable additional source of protein-rich food. Western-style refrigerated warehouse storage is too expensive, as are the large-scale techniques used to produce dehydrated “instant potato”. Concentrating on simple methods of dehydration and the use of solar and other natural energy sources, the scientists’ objective is to produce a technology suitable for village-level operations, that would ensure a year ‘round economical supply of potatoes.

The development of small-scale industries is also seen to be of great importance in Southeast Asia, where the IDRC has been supporting the industrial extension service known as TECHNONET since 1973. The project



is intended to provide technical extension and information services to indigenous small and medium-sized industries, and to provide training for industrial extension officers. The industries involved range from the manufacture of automobile exhaust systems to coloured glass windows, from fish by-products to bricks made from waste paper (see box).

The year under review saw the second meeting of the autonomous TECHNUNET Council, and the first Asian Industrial Extension Officers' Conference. The latter resulted in the formation of a professional industrial extension officers' association. With the first phase of the project now virtually completed and considered a success by the 11 participating organizations from nine countries, planning for a projected second phase is already well underway.

## Building industrial expertise

TECHNUNET was established in April 1973. It was recognized at the time, of course, that this innovative project could run into the kinds of problems encountered by any new venture, and more so in the field of industrial extension which is relatively new to Asia. In the short space of three years, however, TECHNUNET has made considerable progress. The number of participating organizations now stands at 11, from nine Asian countries, whereas the project originally envisaged a membership of six. Training programs have been organized in India, Canada and the Philippines for industrial extension officers, and a professional group with its own ideals and standards is now emerging. As a result, TECHNUNET's directions are set by the TECHNUNET Council, on which the network's 11 participating organizations are represented. Also, industrial extension officers have formed an Asian Industrial Extension Officers Forum, through which their links with each other will be further strengthened.

TECHNUNET publishes an informative monthly Newsletter, and stores technical information that can be retrieved as required. It operates a technical inquiries service, serving as a referral point for the region. It also supports the publication of state-of-the-art reviews on various aspects of industry.

TECHNUNET's success is best measured by what has been achieved in small and medium-scale industries as a result of industrial extension. Two examples illustrate the forms of assistance provided.

"Patis" is a fish sauce popular in workaday cuisine throughout the Philippines, and in some neighbouring countries. This pale amber liquid is produced by fermenting fish or shrimp in brine for three months, then filtering and diluting the essence to a required concentration. A Filipino producer needed help to expand and upgrade production capacity. Starting with such simple changes as improving the physical layout of the plant and working up to a partly-mechanized production process, an industrial extension officer worked out a program that would increase the production of "patis" by some 150 percent.

In Malaysia, the Handicraft Board wanted help at increasing the rate by which the long trunk of the bamboo, a basic raw material, could be split into pieces of useable size. The method traditionally used cut the trunk into two pieces at a time, a time-consuming process. A local industrial extension officer designed a special knife with six cutting blades within a circular frame. Response to the change was enthusiastic, and the original six-blade knife now runs to eight blades. Local handicraft workers are able to work faster, and earn faster, as a result.

As the process of industrial extension grows in Asia, the national organizations now participating in TECHNUNET will deal directly with each other, and the project could then wind itself up having accomplished what it set out to do. Meanwhile, it is helping to build up a body of industrial expertise and to enhance skills in a region where industry needs rapid advancement.



Another project in this region that is supportive of small-scale industry is the development of Regional Adaptive Technology Centres. This project is intended to harness the resources of non-metropolitan universities to encourage technical change in local production centres.

Oriented to small-scale manufacturing operations, the RATCs are based within provincial universities, and through multi-disciplinary teams are able to provide research, training, development and advice to local entrepreneurs. In addition the teams carry out detailed surveys of the operations of local firms. The first such centre involved in the project is based at the Yuengnam University in South Korea. It is a rare attempt to link the technical capabilities of university staff members with the problems of the district they serve, and as such is providing an important example for other non-metropolitan universities, not only in Korea but throughout Southeast Asia.

So far we have looked at projects dealing largely with industrial applications of technology. In India, however, the IDRC in cooperation with a number of international agencies, is supporting a large-scale project to develop and improve contraceptive technology. And in Africa a number of projects got under way this year concerned with another vital aspect of health: sanitation and the disposal of human wastes.

Flush toilets require an enormous amount of capital for sewer construction and an almost unlimited supply of water — two commodities that are simply not available in much of developing Africa. Traditional waste disposal systems exist, but are usually inefficient, unhygienic and ecologically damaging. In Tanzania a search for an alternative waste disposal system

*Construction of compost toilet in Tanzanian village.*





began in 1974. These scientists are attempting to adapt such technologies as a Swedish designed “compost toilet” — that converts both human wastes and kitchen refuse into a usable fertilizer — for use in tropical conditions.

In Botswana a project begun during the past year concentrates on the problems of sanitation in urban squatter settlements, where facilities are at present non-existent. The researchers will adapt or invent techniques, and during the second phase the most promising prototypes will be field tested in a variety of locations. A similar project dealing with sanitation practices in rural areas was also begun during the year in Ghana.

All three projects will also examine ancillary factors such as cost-effectiveness and the best means of disseminating the successful techniques. Studies have shown that up to 75 percent of communicable diseases in developing countries are spread as a result of the lack of sanitary facilities: diseases such as gastroenteritis, the leading cause of infant mortality in Africa. The significance of these projects for all of Africa is therefore immense.

In spite of the astronomical costs, there is also a place in the developing world for space age technology. By making use of data provided by existing orbital satellites such as the American-launched LANDSAT, developing countries can have access to this highly sophisticated technology in developing their national resources at a minimal cost to themselves. The IDRC is supporting a growing network of Third World scientists who are acquiring expertise in the interpretation and use of satellite data.

Two LANDSAT projects were begun with IDRC support in 1974 in Bolivia and Sudan, and have now completed the training phase. During the past year the Centre approved a third project, in Tanzania. The first step is the training of Tanzanian scientists in the sophisticated techniques of space age cartography. The next phase will involve ground surveys and the production of a series of thematic maps of the Rukwa area chosen by the Tanzanian government for the project. They will show vegetation, land use, soils, hydrology and, if possible, land potential.

The Rukwa area, in spite of better than average rainfall, has a low population density, consisting mostly of subsistence farmers. The data provided by LANDSAT is basic planning information, essential before the land can be properly developed. The use of satellite pictures reduces the time required to collect such data, provides a more accurate overall picture, and does it for about one-twentieth of the cost of conventional cartography.

The Centre also continues to provide strong support for DEVSIS, a program for a worldwide computerized network designed to collect and disseminate information on social and economic development. In addition to seconding senior staff to Geneva to help in establishing the feasibility of the system, the Centre is experimentally inputting relevant Canadian material, and is cooperating with Unesco to produce a DEVSIS thesaurus in English, French and Spanish, and a newsletter to inform users about the program’s progress. To help ensure the system’s effectiveness at both the national and regional levels, the Centre is also supporting a number of projects in developing country institutions that will enable them not only to benefit fully from DEVSIS but to provide valuable inputs as well. Perhaps the most important benefit initially, however, is that through participation in DEVSIS developing countries are able to bring their own documentation under proper control.

Technology — whether it means satellites or stained glass windows, processed potatoes or processed data — is essential to balanced development, but to close the technology gap means selecting the right technology — selecting, testing, adapting, innovating — otherwise self-reliance remains simply a slogan.

## Participation, Information, Education



*Tsetse fly.*

As basic a requirement as good food is good health — many would describe it as a basic right. Yet as many as one billion people in the Third World suffer from one or other form of debilitating disease. The vast majority of them live in rural areas or squatter settlements and have little or no access to any kind of health services.

It is with these people that the IDRC is primarily concerned in its support of projects that relate directly or indirectly to health care.

In the preceding section we have seen how adaptive technology is being applied to problems of sanitation. The IDRC is similarly concerned with related problems, such as the adequate supply of fresh drinking water — apart from the obvious hazards of drinking unclean water, one recent study in East Africa noted that a high percentage of bone fractures among women result from falling while carrying heavy containers full of water!

Water. Life cannot exist without it, yet it also harbours many of the insects and parasites that carry the most common tropical diseases — such as malaria, schistosomiasis (snail fever), onchocerciasis (river blindness), trypanosomiasis (sleeping sickness) and the various forms of leishmaniasis. Any one of these diseases can be crippling, even fatal, and the best estimate available is that at any given time up to a billion people may be suffering from one or more of them.

Again the size of the problem is beyond the scope of any single government or agency. This is why the IDRC is collaborating with the World Health Organization and other international institutions in an intensive long-term program to combat tropical diseases. This program has as one of its main goals the training of African scientists — recognition of the ironic fact that most of the expertise in the field of tropical diseases resides not in the tropics but in the industrial north. Networks of collaborating research laboratories are also being established, and their work will be backed up by scientific task forces formed to tackle specific problem areas.

The IDRC has been supporting a number of specific projects in the field of tropical diseases for several years. Since 1972 the Centre has been supporting the work of teams of scientists in West Africa and Canada who are attempting to develop a means of biological control of the blackfly *Simulium damnosum* which causes river blindness — a disease that affects at least one million people in West Africa alone.



During the year under review the Centre approved a further grant for a three-year second phase of this project, during which activities will be expanded to attempt the mass breeding of a parasitic worm that preys on the blackfly. Earlier research has indicated that the introduction of these parasites to the fly's breeding grounds leads to sterilization or death of a significant percentage of the blackflies.

A similar approach is being taken in a new project, begun during the past year, aimed at the biological control of the tsetse fly, which carries sleeping sickness — another of the major tropical diseases that can be fatal if untreated. The project resulted from the recommendations of an IDRC-sponsored symposium in 1974, at which it was agreed that not enough work has been done on the biological control of the tsetse fly, and that a great deal more research is needed.

The project is being carried out in cooperation with the Commonwealth Institute of Biological Control, through their regional facilities in East Africa. The first objective is to collate and catalogue all existing scientific knowledge on the subject, a work that in itself should be of tremendous value to other researchers in the future.

Beyond this the scientists will begin studying two of the tsetse fly's natural enemies: the velvet ant and the bee fly, both of which are common in Kenya. Once the biology of these two predators has been explored, mass-breeding techniques will be developed and the insects released in a tsetse-infested area where the results of the "invasion" can be studied.

During the two years of the project a team of young African scientists and laboratory technicians will receive on-the-job-training that will enable them to continue with work in the field of biological control beyond the experimental period.

The need for information on all aspects of health care is paramount in the developing countries. Since 1973 the IDRC's Information Sciences Division has been collecting and collating literature needed by people who are planning, operating or evaluating health care delivery systems in developing countries. Using the Centre's ISIS computerized information retrieval system, two bibliographies have already been published, and two further volumes will appear during the year ahead.

Another unique effort in the field of health care information was the launching at the end of 1974 of a popular-style magazine in French-speaking West Africa entitled *Famille et Développement*. Since that first trial issue the magazine — which is being supported for its first three years by the IDRC and is published from the Centre's regional office in Dakar — has gone into regular production and is building a considerable readership throughout the region.

Dealing in plain language with issues such as family health, birth control and sex education, as well as broader development issues, the magazine has evoked much favourable comment and is highly sought after especially in the small towns and rural areas.

"You cannot imagine all the good this periodical does for our youth", wrote one reader. Another, a school director, commented: "This periodical . . . arrives at just the right moment for our continent . . . (it) will be one of the most interesting tools for our educational institutions."

The concept of the magazine was developed by Africans, and it continues to receive its direction from a committee with members from eight nations in the region. With subscriptions coming in at the rate of 500–600 a month, the long-term future looks bright for *Famille et Développement*.

# Traditional healers play an important role

In the West African country of Zaire, as in most of the continent, traditional medicine continues to serve a far higher percentage of the people than does modern medicine. Even when people have a choice, they often prefer the services of a traditional healer — or they “play it safe” and consult both.

Now the government of Zaire, with the IDRC’s support, is attempting to find out more about traditional medicine, its practitioners and its clients, with a view to the possible eventual integration of the healers’ services into the country’s health care delivery system. In the process the research team will interview some 250 traditional healers, make a detailed study of their therapeutic rites, and produce two films in cooperation with the Voice of Zaire, the national radio and television network.

In November 1975, Dr George Brown, of IDRC’s Population and Health Sciences Division, was in Zaire, and accompanied by members of the project team was able to visit a number of healers and witnessed some of their rites. He described one “group practice” where 13 healers work together in conjunction with a nearby health centre.

“Each of the healers specializes in certain groups of diseases. For instance, one of them specializes in madness, depression, migraine, and neurological disorders including polio. A second specializes in gynecological problems and a third in infant diseases. They work in rotation and refer cases among each other. They also refer cases to the health centre.”

“Each of the healers in turn presented one or two patients who were under treatment or had been successfully treated. This included two cases of madness, one infant with polio and one woman with lower abdominal pain. It was, of course, impossible for me to evaluate the impact of this treatment, however all the patients looked fairly

well . . . and the child who had been treated for polio could indeed walk.”

A very different style of practice was carried on by Mr Kobi, a faith healer, reports Dr Brown. “Mr Kobi works in a modern house surrounded by photographs of successful cases — mostly couples with young children that he has helped in curing their sterility. There were perhaps 60 people waiting in the courtyard. He frequently sees individuals for a few minutes and takes their problems into consideration, has a vision or a dream, and then makes his divination individually to that person.”

“Mr Kobi is a young man in his 20s, but has been working in this way for 10 years. He had no training as a healer until he had a vision 10 years ago. Now he has several assistants and a fair degree of material wealth. He believes he has some psychic powers, and he certainly has a large following.”

Dr Brown also witnessed the “graduating” ceremony of a woman who had been undergoing treatment for “what looked like a classic case of anorexia nervosa”. He reports: “The women all performed in a line, gradually moving around the circle. They seemed to get in an almost transcendent state where they were totally inside themselves. Some of them were in a deeply emotional state, and it was profoundly beautiful to watch.”

“The patient danced with the others, and my impression was that she was holding herself — well — more erect and more proudly than I had seen her before. All the others had an elegance and a presence about them that was striking.”

The study, which should be completed next year, will provide an objective view of the healers’ role. But more important, says Dr Brown: “The existence of the project gives recognition to the existence of the healers, and they are extremely proud of the fact.”



In its health programming the Centre has not neglected research into traditional forms of health care, and their potential as part of a modern health care delivery system. Thus the Centre supported a study, completed in 1974, of the role of traditional midwives in Thailand, and during the past year began funding an 18-month study of traditional medicine and its practitioners in Zaïre (see box). In a number of countries, where it is simply not possible to provide physicians and hospital services for every rural community, another approach has been attempted: the use of trained village health workers or auxiliaries to provide basic health care and referral service.

In Mexico this past year the IDRC began supporting an experimental program using trained obstetric nurses working in cooperation with auxiliaries and village health workers to bring basic health care to the most remote parts of that country. Recently graduated obstetric nurses (who are obliged to undertake a period of rural service in Mexico) receive a three-months intensive program in family planning, human reproduction and population dynamics as part of their training. Nurses will be assigned to four selected areas, where their job will be to provide health information, education and family planning services to the communities in their area.

Once she has set up a health post, each nurse will select and train a female health auxiliary who will serve as her assistant. This done, she will begin a series of systematic home visits, making the health service known to the people, and identifying potential volunteer health workers who may be able to act as motivators in public health and family planning, and as distributors of contraceptive materials.

The project is being managed by the non-government Population Studies Foundation, which, in addition to running some 90 health and family planning centres throughout the country, provides education and training for medical and paramedical personnel. After 18 months the experiment will be evaluated, and if successful may provide a model basic health care service for thousands of people who previously had no access to any such service.

During the year the Centre also began funding a similar project in rural Thailand, where the objective is to use specially trained local people to distribute family planning information and supplies (see box).

Another large, and continually growing, group of people in the Third World who are also deprived of basic health care services are the urban squatters — rural migrants who flock to the cities in tens of thousands and, finding no place to live, create their own shanty towns, or “pueblos jóvenes” (youngtowns) as they are known in Peru.

The city of Arequipa in southern Peru has some 95 youngtowns with an estimated population of 120,000. In reality the youngtowns are often the worst kind of slums, where the people live in shacks built from whatever materials they can scavenge, and where even the most basic facilities are usually non-existent.

In five of these slums, with a combined population of about 48,000, the IDRC is supporting an experimental attempt by the local authorities to provide the squatters with a basic health service. The project is based on a similar program underway in Cali, Colombia, which was demonstrated at a seminar jointly sponsored by the IDRC and the Ford Foundation in 1974. The Peru project represents the first serious attempt to adapt the approach in another country.

The project has been developed at least partly as a result of the demands for better services put forward by “committees for promotion and development” that have been formed among the youngtown inhabitants.

Thus the experimental model will be based on strong community participation at all levels.

Participation, information, education — a combination that could go a long way towards helping the mass of the people of the Third World to attain that basic right: good health.

## The village volunteer is one of us

A recent survey in rural Thailand showed that three out of four mothers wanted no more children — they were aware that fewer babies usually meant a healthier, happier family. So far, so good for the Ministry of Health in its ambitious program to reduce the population growth rate. But this raises another problem: how to provide family planning services on such a scale when only one village in 10 is covered by a health worker?

The problem called for a new approach, and the Ministry, in cooperation with the Faculty of Health of Bangkok's Mahidol University and the IDRC, appears to have found one: recruiting and training village volunteers to distribute contraceptive supplies and provide family planning advice and referral service.

The volunteer scheme was the inspiration of Dr Debhanom Muangman, the dynamic young Dean of Mahidol University's School of Public Health who is Director of the two-year pilot project. Mahidol University had earlier conducted the successful action research project to involve traditional midwives in the public health service. Now Dr Debhanom focussed on another need — how to make family planning services available to the most villagers at the least cost.

It hasn't been easy. The district of Po-Thong, with a population of 52,000, was selected for the pilot project. When the project team arrived in May 1975 to conduct a detailed advance survey of some 1,000 families they faced some unexpected difficulties. Noted the Director: "The main obstacles were heavy rainfall, bad roads . . . and cobras! As the rains had flooded their holes, the snakes came up for air. We killed cobras almost every day."

With the groundwork completed, the next task was the selection of one volunteer for each village. This was done last summer by the village headmen and the local health worker. In December 28 local health workers and 92 village volunteers — most are married, about



*How to provide family planning?*

half are farmers, the others mainly shopkeepers — attended their second training course together. There had been few drop-outs since recruitment.

The volunteers are supervised in their work by the health workers, and are the first "non-health" personnel to receive certification from the Ministry. They also receive a small commission on sales of contraceptive pills and condoms.

It is too early yet to judge the project a success, but early reports are optimistic. During the August to December period the volunteers registered some 700 new pill acceptors, and sales of condoms also showed a marked increase. The project's cost-per-acceptor is low — \$1.67 (Cdn) compared with the current national average of \$8 to \$9. But perhaps most important is the degree of involvement of the villagers themselves. They seem well satisfied that the volunteer "is one of us, and his services are next door."

The main objective now, says Dr Debhanom, is to maintain that initial level of enthusiasm and to evaluate which type of village volunteer is most effective. And for the long term? The Dean looks forward to the day when the village volunteer service can be expanded to include other basic health services, such as nutrition advice and parasite control, that are urgently needed by the villagers.



## Projects Are About People



*Education by radio in Bolivia.*

International development. It is a term that has become very familiar in the past 25 years or so — what with the growth of development assistance programs and agencies, and a succession of Development Decades declared by the United Nations. Yet the word “development” and its derivatives are still hard to define. No one has yet been able to describe the perfect state of “developedness”.

Lately the term “less-developed” has begun to replace “under-developed” and “developing”. This is good, for it more accurately conveys the sense of relative position: there is no such thing as a developed country, there are only countries which are more — or less — developed than others. And development, or the lack of it, is primarily concerned with people and the way they live.

The next few pages too are concerned with projects that do not fit comfortably under the headings of Food, Technology or Health (although they may have much to do with one or all of them). Projects that are concerned with people and the way their lives are affected by the change that development brings in its wake.

During the past several years the IDRC has been supporting a number of projects in rural areas of Africa and Asia that will collectively contribute much to the understanding not only of how change can be brought about, but how it affects people, and why. In Nigeria, Kenya, Tanzania, Malaysia, Korea, Indonesia, the Philippines and Sri Lanka researchers are attempting to analyze and understand the intricate web of relationships that makes for a successful rural development project, or a failure.

Such projects usually involve agricultural improvement, irrigation, water supply, roads, schools, housing, health: projects that may be imposed by one or other level of government, or brought about by the demands — and the efforts — of the rural people themselves. By studying the impact of such projects, the researchers hope to be able to show how governments can best respond to such demands and support self-help programs, and how the people can prepare themselves to cope with the expectations created by a government trying to bring modernization and change to the country without destroying the traditional way of life.

All these independent studies are linked through the IDRC to form a network of researchers that is providing a growing storehouse of factual



information about the process of modernization and change. Such a pooling of data should prove invaluable to the policy-makers, the planners and the people for years to come.

Another problem common to many nations of the Third World is the predominance of young people in the population. In many countries more than half the population is under 25 years of age, a situation that places enormous demands on the education system and the job market. The end result is that millions of young people find themselves (with or without an education) unemployed, or at best under-employed.

Although the problem is a relatively new one, a number of innovative attempts have been made to improve the young peoples' lot and to channel their energies into the national development effort. One approach that has been developed in various forms in several countries during the past 10 years or so is the study-service scheme. Although such schemes vary widely in specifics, most such programs, as the name implies, are designed to involve young people in some form of community service as part of a (formal or non-formal) learning process.

The growth of study-service programs, and the apparent success of some of them, prompted the IDRC to support a request for a multi-country evaluation of such programs. Research teams in Thailand, Indonesia, the Philippines and Sri Lanka (see box) began work in 1974 gathering data about study-service schemes and studying individual community projects.

The study also aims at developing an information exchange network not only among the participating research groups, but with interested groups in other countries. Another major objective is to identify the best type of program to maximize the benefits for all involved and allow small-scale pilot projects to develop into national programs.

There was a lot of talk during 1975, International Women's Year, about women's socio-economic role in the development process, and specifically about increased participation of women in the labour force. Yet surprisingly little is known in most developing countries about the full extent of women's present economic role, both within the family and at the national level; about the types of work women do, and why; or about the likely impact on national



*Study-service volunteers meet with villagers in Thailand.*



# Learning and serving

There is no such thing as a "typical" study-service program. Each is as distinctive as the culture in which it has arisen, varying in structure, organization, recruitment and operation. Some are organized by educational institutions, others by government departments, others grew from the grass-roots efforts of concerned individuals or groups. The term of service may be voluntary or compulsory, full-time or part-time, long-term or short-term.

One thing all study-service programs share, however, is a common objective to offer young people a worthwhile educational experience by involving them in practical activities to help meet the basic needs of other people. It is a process of serving and learning.

Sri Lanka's Sarvodaya Shramadana movement is one of the oldest of the study-service programs in the research and information network being supported by the IDRC. It began in 1958 when a high school biology teacher, Mr A.T. Ariyaratne, took a group of young people from an elite school in the capital, Colombo, and set them to work with the people of a remote, poverty-stricken village. In spite of the social and economic differences between them, in spite of the reservations of the "experts", an enthusiastic rapport was established between the villagers and the young people, and the project was a success.

Over the years the movement has attracted the attention — and the support — of other teachers and students, social service organizations, community groups and trade unions. By 1972 it was a fully-fledged national movement for rural development with some 20,000 volunteers working with 80,000 families in 500 villages, and Mr Ariyaratne was obliged to resign from teaching to become the movement's full-time Organizing Secretary.

Today the movement offers advanced training courses at its headquarters near Colombo, encompasses perhaps 1,000 villages, and is still growing both in size and reputation. Although it now receives strong government support, the movement still guards its independence.

Contact with a village usually comes when the people ask for assistance. Together with members of the movement they identify the most pressing need — the construction of an irrigation reservoir, perhaps, or the building of a new road. The movement then helps the village establish a Shramadana, a voluntary work camp at which local villagers, people from other villages already involved with the movement, and volunteers from the towns and cities, work together for eight hours a day, then spend up to another four hours on education through discussion, song and dance.

In the camps the villagers are organized into children's groups, youth groups, women's groups, farmers' groups, and so on. These form the basis of future development in the village. Through them the people are able to discuss their problems, needs and wishes with each other and with officials, and plan what action to take.

Part of the reason for the success of Sarvodaya — besides the drive, energy and inspiration of its leader — is its strong philosophical foundation, which is based on a mixture of Gandhian and Buddhist spiritual thought, and reaches deeply into the national culture and tradition. Cooperative labour in rural Sri Lanka, as in much of Asia and Africa, is a practice that dates back to well before colonial times. And it is here perhaps that Sarvodaya — the word means "awakening" or "liberation" — shares a common bond with study-service programs in other parts of the Third World.

development of a major increase in the female labour force, especially in the light of the current high levels of unemployment and under-employment.

Following an IDRC-sponsored workshop in June 1975 on the subject of women's economic participation, three Latin American countries approached the Centre for support in making a survey that would answer some of these basic questions and enable policy-makers to plan on a more informed basis. Separate teams of researchers in Argentina, Bolivia and Paraguay will make detailed studies of women at work and of the labour force as a whole, and will analyze changes in the working populations of their countries over the past 25 years. By comparing results the researchers will be able to identify distinct trends, and put together a clearer picture of the situation on which to base future policies leading to greater participation for women in their countries.

Almost since its inception the IDRC has been closely involved with an innovative multi-purpose rural development project in the mountainous Eastern Cundinamarca region of Colombia. Although the primary aim of the project is to increase farmers' incomes through the improvement of farming methods, it is also concerned with "household management", covering such areas as health, nutrition, sanitation and education. This aspect of the program entered a new and promising phase during the past year with the successful completion of a pilot pre-school program.

An earlier study of the eating habits of some 259 families in the area had shown that most did not get enough essential calcium and vitamin A nutrients in their diet. The double-barrelled response of the research team was to establish two pre-school centres in 1974 with the cooperation of local teachers. Twice a week the children would come and learn what school was all about (and enjoy a simple high-protein meal) while their mothers attended courses in improved nutrition.

The centres were run by specially trained local girls, and at the end of the first year the results exceeded expectations, with parents, teachers and children being so enthusiastic that 11 centres were set up in 1975. In addition, the National Department of Planning, on seeing the results, offered to finance both the training program and the first full year of operation.

The pre-school centres will also continue to provide a base for further research on the effects of malnutrition. In future the researchers from the Colombian Agricultural Institute, which runs the entire program, hope to establish whether or not there is a link between learning disability and vitamin A deficiency. A positive result would at least partly explain slow learning in school, and would be of enormous significance to people in poor rural areas throughout the Third World.

For many people in remote parts of Latin America the only regular form of communication with the outside world is the radio — it is also often their only access to education. In Bolivia, where an estimated 4 million people live in rural areas, the IDRC is supporting a study of 12 independent community radio stations that together form an informal association called ERBOL, the Radiophonic Schools of Bolivia. The aim of the study is to determine if it is feasible (or desirable) to create a fully integrated radio network out of the present informal grouping, and whether such a move would increase the stations' ability to provide non-formal educational programming for the rural people.

In the Dominican Republic the Centre is supporting another study of community radio programming. This study involves analyzing audience response to a series of programs dealing with sex-education and family



## Becak — a bicycle made for three



*The becak, and a motorized competitor.*

The cry of “becak, becak” follows potential passengers down the streets of most Indonesian cities, reaching a high pitch in the market place, where dozens of the vehicles and their drivers line the curb. A colourful part of the city scene, these brightly painted, bell-festooned tricycles are the main mode of transportation for many of the cities’ inhabitants.

For those with strong backs and few skills to offer — often migrants from the countryside unable to find any other form of work — they also provide a valuable, if brutally exhausting source of employment. For others becak driving is a seasonal occupation providing important extra income during lulls in work on the farm.

But just as the introduction of the becak in the 1930s spelled an end to the horse-drawn cart, so the ever-increasing fleets of minibuses and other motorized vehicles are weakening the becak’s monopoly in urban transportation systems. There are other factors too. Where once the becak was adequate, the rapid pace of modern cities requires a faster means of getting about. Slow and cumbersome, becaks are frequently blamed for accidents and traffic congestion. The longer distances they must travel in the expanding cities also mean increased fares, compelling customers to favour communal motorized transportation. The ensuing stiffer competition for fares often leads drivers to ignore or violate traffic regulations.

Moving to lessen some of the inconveniences caused by the becaks, municipal authorities have adopted several policies. In Jakarta, for instance, becaks are banned from the city centre and main thoroughfares. In parts of the city special lanes have been provided, and based on a colour code, becaks are restricted to specific areas, necessitating numerous transfers to reach one’s destination. Public opposition to these policies has been strong.

In an attempt to help policymakers gain a better understanding of the becak’s function, both as a transportation system and as a means of employment, researchers from the Gadjah Mada University and the Bandung Institute of Technology are gathering and analyzing information about the vehicles, their owners, operators and customers. This study is part of a multi-city analysis of low-cost transportation systems being supported by the IDRC in a number of Asian countries where, although the vehicles may differ, the problems are much the same.

Similar to the now-completed study of the role of hawkers and vendors in Asian cities, this project aims at assisting municipal authorities in their efforts to manage and integrate the vehicles in the urban transportation system in a way that is acceptable to the city planners, the becak operators and their passengers.



planning. In addition to assessing the value of such programming and providing guidelines for program producers, the study will provide valuable research experience for the staff members of CIACOP, the Inter-American Center for Training in Communication for Population and Family Planning, which will conduct the survey and disseminate the results.

The year under review also saw the completion of a unique project that involved a study of the role of hawkers and vendors — street traders — in several major Asian cities. As a conclusion to the project a conference of mayors and municipal leaders was held in Kuala Lumpur in October at which the researchers presented their final report and recommendations. The report, together with a slide presentation and a booklet summarizing the findings, were well received, and may do much to rationalize the situation, making life simpler and better for the hawkers, their clients and the city officials in future.

An equally colourful aspect of Asian city life are the various “informal” methods of public transportation — from bicycle-powered passenger carts to mini-buses. Like the street traders, they cater largely to the poor, and, also like the street traders, they present headaches for city planners (see box). The IDRC is supporting a further urban study aimed at providing a better understanding of the role of these low-cost vehicles and their operators, and making recommendations on how they can be made to fit into the total modern urban system.

In the limited space available in these pages it has not been possible to give a comprehensive report on all the new and on-going projects with which the IDRC is concerned. Rather the aim has been to present a cross-section, a kaleidoscopic viewpoint illustrating the complex and interrelated nature of the problems that are being faced by the countries of the Third World. The IDRC’s purpose is not to solve these problems, but to provide the resources, the training, the information, the encouragement, and, where necessary, the expertise to enable the people of the developing nations to resolve their own problems in their own way according to their own priorities.



*Their own priorities: participants at an IDRC-supported seminar on rural water supply in Africa.*



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Published in three separate language editions, this is a quarterly magazine about the work supported by the International Development Research Centre and about related activities in the field of an international development, and is available on request from the Centre's Publications Division.





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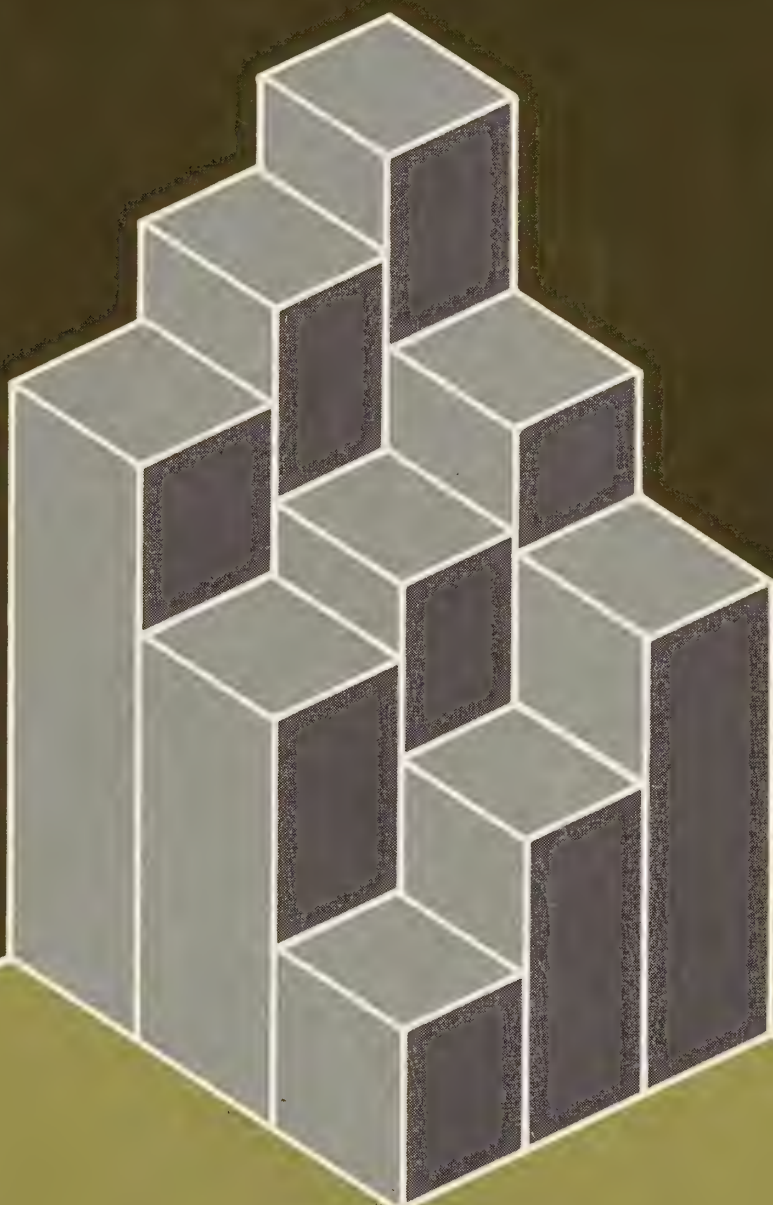


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# On Common Ground

Report on the activities of IDRC 1976/77

IDRC-087e





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Il existe également une édition française de cette publication

La edición española de esta publicación también se encuentra disponible





# Some basic facts about IDRC

## **When was the IDRC set up?**

The Centre was established by an Act of the Canadian Parliament assented to on 13 May 1970. The first meeting of the 21-member Board of Governors took place in October 1970.

## **Why was it set up?**

It was set up (in the words of the Act) "to initiate, encourage, support and conduct research into the problems of the developing regions of the world and into the means for applying and adapting scientific, technical and other knowledge to the economic and social advancement of those regions".

The Centre was established as a public corporation, to give it the greatest possible measure of flexibility and autonomy while still being accountable to Parliament. Its funds are in the form of "untied aid", which allows it to secure the best available professional skills and to finance projects in the most appropriate way, regardless of the origin of the research workers and the source of equipment.

Heavy emphasis is placed on support for research workers living and working in the developing regions. The great majority of projects are being carried out in those regions, and all of them are under the direction of a scientist or administrator of that region. Some research is financed by the Centre in Canada, at universities and elsewhere, in support of field projects in the developing regions. This emphasis has been taken to fulfill the objective of the Centre, as stated in the Act, "to assist the developing regions to build up the research capabilities, the innovative skills and the institutions required to solve their problems". Most projects include a training element, and the Centre's Human Resources Awards

Program also provides for the training and development of young professionals.

## **How much has been done?**

From October 1970 to March 1976 the Board approved support for 503 projects, which required appropriations of \$94 million. A few projects involve expenditures of more than \$1 million, while others involve less than \$5000; the average has been about \$200,000. Some 94 projects have been completed. Research has been taking place in some 80 different countries.

## **What are the principal sectors in which research has been supported?**

Research to improve food production and nutrition has been a foremost concern. Crop research in the semi-arid tropical regions was a starting-point for this agricultural research. Improvement of health care in rural communities, and an understanding of the many variables that influence couples in deciding the size of their families. An understanding of the processes of modernization and change, and of the social, economic, political and cultural consequences of change. Improvement of the means of collecting and disseminating information for and about development.

## **How international is IDRC?**

The Board of Governors consists of 11 Canadians and 10 non-Canadians. Six Governors are drawn from developing countries.

The centre has established five regional offices — in Singapore, Bogota, Dakar, Cairo and Nairobi — four of which are headed by nationals of the region.

## **How does it fit in with the work of the Canadian International Development Agency?**

IDRC has been the managing agent for several of CIDA's two largest grants in agricultural research. Staff from each organization attend the other's project review committee meetings. In general, IDRC supports the more innovative and risky research, and passes to CIDA proposals for larger-scale support of projects incorporating proven new technologies.



# Introduction

The year under review, April 1976 to March 1977, has been an active one for the International Development Research Centre, and one during which the Centre has seen a number of its initiatives come to fruition.

The IDRC played a key role in the establishment of the International Centre for Agricultural Research in the Dry Areas, and was instrumental in bringing together a group of donors to establish the International Council for Research in Agroforestry, which will begin operations in the near future. Both these institutions are aimed at filling vital gaps in the research capabilities of the Third World.

The Centre also continues to make a major contribution to the establishment and expansion of international information systems in fields such as agriculture, rural water supply and sanitation, and development sciences — systems that will provide for a worldwide exchange of scientific information.

What follows is a brief review of some of the research supported by the IDRC during the past year — new projects, continuing projects and completed projects. First, however, a few facts and figures.

During the year the Centre's international Board of Governors approved 137 new projects requiring a total appropriation of \$26.7 million — a considerable increase in activity over previous years. The Agriculture, Food and Nutrition Sciences Division undertook 55 new projects totalling \$12 million; the Social Sciences and Human Resources Division 25 new projects costing \$5.7 million; the Health Sciences Division 29 new projects for \$4.1 million; and the Information Sciences Division 21 new projects for \$4.5 million.

A further \$1.9 million was committed during the year in support of 216 Division Activity Projects — seminars, workshops and consultancies that are usually preliminary to the undertaking of a full-scale project. The Centre also continued to invest heavily in the training and development of young Third World professionals through its Human Resources Award program, which made available 87 grants totalling \$1.8 million.

During the year 42 projects were completed, bringing the total number of projects completed since the Centre opened its doors to 94. In addition, many projects have now entered a second or even a third phase, as researchers continue to build on the results of earlier years.



*Agroforestry — the combination of crops, trees and animals on the same piece of land — is one area in which the Centre is concentrating its research support.*

There have been several changes in the membership of the Centre's Board of Governors, including the welcome return of Mr Maurice Strong, who was a member of the Centre's original Board in 1970. Dr Louis Berlinguet, former Vice-Chairman of the Board and Chairman of the Executive Committee, relinquished these positions to take up the new staff position of Senior Vice-President.

There have also been a number of changes among the Centre's senior staff. Dr Lucien Michaud left his post as Vice-President, Canada and Donor Relations, to become President of Laurentian University. Cheik Hamidou Kane returned to his native Senegal to take charge of the redevelopment of the port of Dakar. His post as Vice-President, International, is now held by Mr Nihal Kappagoda of Sri Lanka, formerly the Centre's Regional Director in Asia. Mr Jon Church was appointed to the new post of Vice-President, Administration. A full list of the Governors and Officers of the Centre is included elsewhere in this publication.

A considerable proportion of the Centre's headquarters staff are Third World nationals, and the majority of the staff of the five regional offices are drawn from the regions they serve. The regional offices — in Bogota, Cairo, Dakar, Nairobi, and Singapore — are vital to the Centre's operations. They are in the front line, maintaining essential contact with the governments, research institutions, universities, research workers and scientists of the developing countries, and providing the communications link to ensure that the Centre's priorities remain relevant to the needs and aspirations of the nations of the Third World.



# The Board of Governors

- \*Louis Rasminsky  
\*\*Chairman of the Board of Governors  
Ottawa, Canada
- \*Roger A. Blais  
\*\*Vice-Chairman of the Board of Governors  
Chairman of the Executive Committee  
Montréal, Canada
- \*W. David Hopper  
\*\*President and Chief Executive Officer  
Ottawa, Canada
- Aklilu Habte  
Addis Ababa, Ethiopia
- \*Manuchehr Agah  
Tehran, Iran
- \*Pierre Bauchet  
Paris, France
- \*John Milton Bell  
Saskatoon, Canada
- Sir John Crawford  
Canberra, Australia
- \*Norman T. Currie  
\*\*Chairman of the Finance Committee  
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- Paul Gérin-Lajoie  
Ottawa, Canada
- Peter A. Green  
Halifax, Canada

- Dr. Ilunga Kabongo  
Kinshasa, Zaire
- \*Archie R. Micay  
Winnipeg, Canada
- R. Stephen Milne  
Vancouver, Canada
- \*The Hon. Rex. M. Nettleford, O.M.  
Kingston, Jamaica
- \*T. W. Schultz  
Chicago, U.S.A.
- Dr. Soedjatmoko  
Djakarta, Indonesia
- Maurice F. Strong  
Calgary, Canada
- Victor L. Urquidi  
Mexico
- \*Sir Geoffrey Wilson  
Wantage, England
- \*William C. Winegard  
Guelph, Canada
- \*Executive Committee member at 31 March 1977
- \*\*Finance Committee member at 31 March 1977

## Officers of the Centre

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Nihal Kappagoda

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E. Anthony Price

West Africa (Dakar)  
Stanislas Adotevi

Middle East and North Africa (Cairo)  
Salah Dessouki

Latin America (Bogota)  
Henrique Tono T.



# Land and People

Two-thirds of the world's surface is covered with water. On the remaining one-third — an area of about 57 million square miles — live some four billion human beings. Man may venture onto the sea, or under it; he may fly in the atmosphere or beyond; but he must return eventually to terra firma. Like it or not, man's home for the foreseeable future is here on dry land. This is man's habitat — it is our common ground.

Habitat was the name given to the United Nations Conference on Human Settlements in Vancouver last year. Much of the emphasis at that conference was on the problems of the cities, but there were those who pointed out that virtually all humans live in settlements, and that the majority of these are small towns and villages in the rural areas of the developing countries. And what happens here in the rural areas of the world determines to a large extent what happens to the cities in the future.

Many of the problems of the cities, especially in developing countries, are the result of mass migration from the rural areas. All over the world people are leaving the land, moving from the villages and towns to the cities in search of a better life, with the result that already overcrowded cities become impossibly congested. Growth in city population far outstrips the city's ability to provide for its inhabitants. The word "megapolis" has entered the language — by 1985, according to economist Barbara Ward, there will be 273 cities with populations of more than one million, and there will be 17 with populations of more than 10 million. The possibility of urban collapse is very real in many of these centres; and as the problems encountered by New York City dramatically demonstrated during the past year, the dangers are by no means limited to the Third World. We are on common ground.

Some countries have made attempts to persuade, or coerce people back to the land, to resettle them in new communities away from the cities. Such solutions at best can only be partially successful, and in any event they beg the real question: why are the people leaving the rural areas to move to the cities? And its corollary: what can or should be done to make people want to stay in the small towns and villages?

The answers are many, complex and as yet incomplete. At risk of over simplification, they can perhaps be summed up in a simple statement: if people are leaving the rural areas in search of a better life, then one solution is to make life better in the rural areas. As in good medical practice, the solution ultimately lies with prevention rather than cure.



*A resettlement project in Malaysia — one solution to the problem of overcrowded cities is to improve life in the rural areas.*

If conditions are to be improved for rural peoples, one of the basic requirements in many countries is land reform. When the farmer and his family have security, they are less likely to want to leave the land.

The redistribution of land, however, does not automatically solve all the problems; often there is also a need for organization, instruction and, above all credit, so that the small farmer can make the most of his land. The government of the Philippines has undertaken a unique project to ensure that these factors are not neglected in the national land reform program.

Small farmers are encouraged to form village associations, to which they contribute a small portion of their incomes as savings, and through which they receive training in modern farming techniques and cooperative organization. Only when it is ready is the association transformed into a “cooperative” under the management of a full-time government official. To retain their membership, farmers must continue to contribute savings and practice modern farming. Membership is important, because only members can obtain credit and participate in the land reform program.

For the past three years the IDRC has been supporting an evaluation by the University of the Philippines of the impact of the program, with the objective of making it more effective and efficient. The evaluation, now completed, has been a major undertaking. There are some 15,000 village associations in 40 of the country’s 68 provinces. Some 8,000 people were interviewed nationwide to obtain comparisons between those provinces participating in the land reform program and those that are not. Preliminary reports indicate that the evaluation will benefit not only the country’s 600,000 small farmers, but also their counterparts in other countries where the program’s progress is being closely followed.

Such reforms, and other attempts to modernize rural areas in developing countries, inevitably have an effect on the traditional ways of life of the rural people. Concerned that any negative aspects of such change should be minimized, the Centre is supporting a number of projects in Africa and Asia that examine the processes of modernization and change and their impact on the lives of rural peoples.

Researchers in Indonesia and Malaysia are studying the effects of technological change on rural communities. In Kenya social scientists are seeking ways to bring about greater cooperation and understanding between central government planners and active local communities that are



attempting to bring about development through their own efforts. And in Nigeria, where the federal and state governments are restructuring the local government system inherited from the colonial era, a Centre-supported study was completed during the past year (see box).

Whatever plans governments may devise to speed the development of their countries, however, their implementation depends in large part on the efficiency and honesty of the bureaucracy. Yet little is known about either the extent or the effect of "negative bureaucratic behaviour" on development efforts.

The countries of Asia are concerned to find out, however, and in 1975 the Centre approved a grant to three governments that had requested support for a pioneering study of negative behaviour within their own bureaucracies. News of the study generated considerable interest in the region. Within a few months two more countries joined the original three, and during the past year proposals were received from five more, bringing the total number of participants to ten.

## Nigeria's chiefs are more than a tradition

The rapid modernization of rural areas requires the active participation of all the people, and such participation requires an efficient system of local government. Aware of this need, the Nigerian government has in recent years given priority to restructuring all levels of government.

A determined effort is being made to design a new system of local government that will incorporate the best of what is traditionally African, and provide a link between the federal government and the country's 55 million people living in 19 States.

As part of that effort a team of researchers from the University of Nigeria at Nsukka recently completed an in-depth two-year study of local government institutions in three states. With the support of an IDRC grant, the researchers set out to determine the effectiveness of various traditional forms of local government, their impact (or lack of it) on development programs, and what the people thought about them.

Some of the study's conclusions were surprising. For example, 90 percent of those interviewed favoured retaining the rule of the chiefs, even though they were aware that not all the chiefs were

genuine, and that some had actually usurped their power. Many saw the chief as a sort of "father figure" whose authority held the community together and guaranteed the continuance of traditions. The researchers, however, felt that the chiefs should be more than mere custodians of tradition, and recommended that they be given an important role to play in the process of modernization, with political, socio-economic and judicial responsibilities.

The role of the modern chief was just one of the recommendations put forward by the University team, some of which have been rejected, but many of which have already been incorporated into the government's plans, a fact of which the researchers are justifiably proud.

Nigeria is one of the largest and most populous African nations. Its attempts to restructure and revitalize government at the local level are being closely watched by other African nations. And the knowledge gained by the Nsukka study will be shared by researchers in Africa and Asia who make up a network of Centre-supported projects concerned with the process of modernization and change in rural areas.

The studies, lasting two years, will begin by identifying and analyzing negative bureaucratic behaviour, which for this project is defined in terms of legal not moral criteria. The researchers will also study the differences between what is socially acceptable on the one hand, and what the law considers to be acceptable on the other. Finally, they will estimate the social and economic costs, and especially their effect on development programs.

Farming is naturally the primary occupation in rural areas, but there is also a need for alternative or supplementary sources of income and employment. Many developing countries are looking to small-scale industry to provide this alternative, but even where traditional industries already exist, they are all-too-often inefficient and poorly managed, and would benefit from expert advice. This is the role of TECHNONET Asia, a network of 11 organizations from nine Southeast Asian countries that was formed in 1973 with IDRC support, and entered its second phase during the past year.

Through a monthly newsletter, a technical information service and, most important, the training of a cadre of industrial extension officers who can respond to requests for assistance from small industries, TECHNONET is providing an important service for Asian industries, many of them in rural areas. During the second phase there are plans to expand the training program and "Asianize" the technical information service so that the network will be completely autonomous by 1980.

Another Centre-supported project in Asia concerned with the promotion of small-scale industries has just got under way. Researchers in seven countries will take a close look at government programs in support of small manufacturing enterprises, including financial and technical assistance, training and extension activities, and coordination among different agencies in the field.



*Basketweaving in the Philippines — small-scale industries like this one can benefit from the services provided by TECHNONET Asia.*

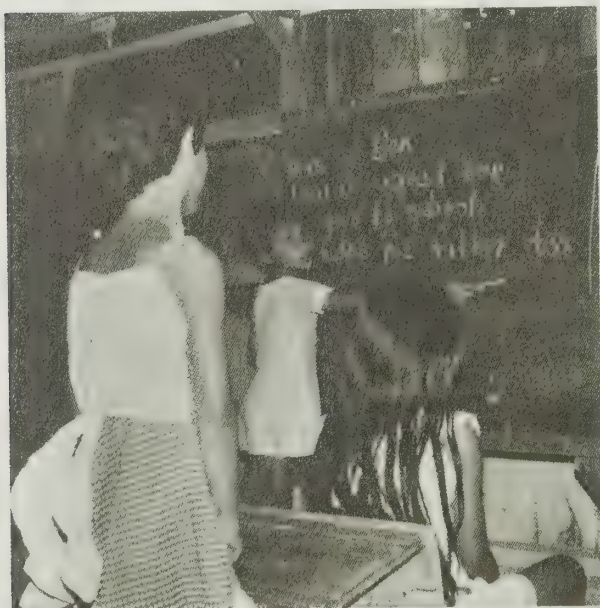


## IMPACT system helps spread the load

"Our concern is not with schools, it is with the education of our children." That simple statement sums up the concept behind an innovative attempt to provide universal primary education in Southeast Asia without the crippling costs normally associated with such an objective.

The scheme is called Project IMPACT. It began in 1974 at two separate rural locations, in Naga district in the central Philippines and near Solo in Indonesia. This experimental approach to the problems of mass education is being undertaken by the Southeast Asia Ministers of Education Organization (SEAMEO) through INNOTECH, the regional Centre for Education Innovation and Technology.

*Peer group teaching in a village school — the IMPACT system allows children to get an education and help on the family farm.*



Self-instructional booklets developed by the research teams and known as "learning modules" are the key to the IMPACT system. These modules follow the normal syllabus for Grades 4 to 6, but divide the learning into booklets covering about 3 to 5 hours work, and contain tests which are checked by a tutor or teacher.

Each child proceeds at his or her own pace, and is free to obtain help from parents or friends, older students acting as tutors, or teachers. To a large degree the children in fact teach and test each other. Comparative tests in both countries have shown that IMPACT students score higher than their counterparts in conventional schools.

The five schools at Naga and four near Solo have been transformed into learning centres — part library, part testing area, part administrative centre. Most of the studying is done outdoors, and the flexible system allows students to fit family duties into their schedule, so that in theory no child need "drop out" because of irregular attendance. The IMPACT system in fact tackles the issues of out-of-school youth by suggesting that they are not a separate category, but can catch up with studies at any time. Experiments with "learning posts" in village homes have also helped draw some out-of-school youth and even a few adults into the system again.

On the economic side, the system has spread the teaching load so that a school of 280 students that used to employ 10 teachers is now run by three or four instructional supervisors (the new name for teachers in the IMPACT system). This saving is one of the project's major achievements, and the teachers have shown remarkable adaptability in adjusting to their new role.

The second phase of Project IMPACT will not be completed at Naga and Solo until 1979, but it has aroused such interest in developing countries that the IDRC is preparing a booklet for publication in 1977. Entitled *Project Impact*, it will describe the progress of the first three years of the experiment.

In each country a minimum of 100 manufacturers — in sectors such as textiles, leather and wood products — will be asked about their experiences with government programs, as will the agencies concerned. The researchers will also look into the broader question of the place of small enterprises within national development programs. Care is being taken in this project to use common methodologies so that a comparative evaluation can be made at the end of the study.

The promotion of small-scale industry is accepted as an important development objective in many Third World countries; the study should yield findings that will assist in developing policies to meet that objective.

Another project in the field of science and technology research that could have broad application is now underway in Mexico. Its aim is to pave the way for the rational development of technologies that will be of real benefit to poor rural communities. The problem of relating appropriate technology to rural development is a complex one. The Mexican project is a pilot study that will begin by examining past experience in the field, and defining criteria for measuring the success, or failure, of a particular innovation.

It is a field which there is a great deal of uncoordinated activity, but there have been few attempts at an overall evaluation of such activities. This Centre-supported project, which is an integral part of a larger study of the rural economy being carried out by Mexican researchers, should help to provide some guidelines for planners, not only in Mexico but also in other countries concerned with linking new forms of technology to the problems of rural development.

Industry and technology, even on a modest scale, usually require some form of energy. There is little likelihood, however, that electricity can be made widely available in the rural areas of developing countries in the foreseeable future. The search for alternatives is complicated by the fact that surprisingly little is known about present or future energy supply and demand in rural areas. The government of Fiji, for example, plans to introduce rural industry to the islands, but is hampered by an almost total lack of information about rural energy supply.

Now a research team from the University of the South Pacific, supported by an IDRC grant, is surveying rural communities in selected areas to establish what are the present and future energy needs in the islands. As part of the project the researchers will also study alternative energy sources, with special emphasis on the feasibility of biogas production using waste vegetable matter.

The one-year study will also examine possibilities for local manufacture of plant hardware for new energy production, and will look into the sociological implications of any changes that may result from new energy supplies. To ensure contact between the project and the policymakers, an advisory committee has been set up consisting of both government and university experts.

Another reason families move away from rural areas is to seek better educational opportunity for the children. To provide a school and teachers for every village is beyond the resources of most countries, so the children must often travel long distances on foot in order to attend a school that is probably overcrowded and understaffed. Many of them never complete the primary grades, and only a tiny percentage pass through the secondary school system.

Since 1973 the Centre has been supporting Project Impact, an exciting experiment in the delivery of mass primary education in Indonesia and the Philippines (see box). This project, which entered its second phase during the



past year, has attracted considerable attention from educators in other developing countries, many of whom have visited the project sites over the past two years. As a result of one such visit the Centre received a proposal from the government of Malaysia for a project that would build on the achievements of the Impact experiment and determine if such a program could be replicated in a different social and cultural context.

The project, which was approved for funding at the end of the past year, is aimed primarily at improving the quality of education for children in rural areas, while at the same time reducing costs. It will become part of the Malaysian government's concerted program to eradicate poverty and provide educational equality throughout the country.

With education comes the need for information. In most developing countries newspapers circulate in the cities and large towns. Where they do penetrate to the village level they are often already dated, and in any case contain little that is of direct relevance to the rural people.

The need for a special kind of news media for rural areas was recognized at a seminar in Bali, Indonesia, in 1975, attended by communicators, publishers and policymakers from Asia and Africa. Such media should be able to report relevant news about science, technology and development in suitable language; to serve as an outlet for the views of rural people; and generally to provide a vehicle for non-formal adult education.

The Asian Mass Communications Research and Information Centre (Amic), one of the co-sponsors of that seminar, has recently begun a follow-up project with the support of the IDRC. In the early stages Amic will study past and present experiments in operating rural news media, and assess the type of print media best suited to rural areas. The second phase will be a feasibility study on establishing an experimental development-oriented newspaper in a typical Asian village. The studies, the first of their kind, will be carried out in India, Philippines, Sri Lanka and Thailand over a period of 18 months.

Land tenure, essential services, good government, education and varied employment opportunities all contribute to a better standard of living. These are some of the "social" needs of people in rural areas. But life for rural peoples can never be secure so long as they are subject to the scourge of tropical diseases, the hazards of environmental degradation and the vagaries of the elements. What can be done to improve these aspects of rural life in the Third World is the subject of the next section of this review.

# Water and Health

The close of the year under review saw another United Nations symposium — the Water Conference in Mar Del Plata, Argentina. That gathering focused on what had earlier been a major concern at Habitat: the need for fresh, clean water — for drinking, for washing, for irrigation — and the fear that water supplies, far from keeping pace with population growth are actually diminishing.

Again it is the rural areas in developing countries that are in greatest need, and it is here that the IDRC has been placing increasing emphasis in the past two years. The question of water supply, however, is a complex one. The installation of a pump or a well in a village does not of itself guarantee that health conditions in the village will improve. Lakes created by large scale irrigation dams can result in the spread of water-related diseases. And excessive irrigation can lead to the salination and waterlogging of irrigated areas, rendering them unfit for farming.

Water supply, then, must be considered not simply in terms of making more water available. It involves a whole range of disciplines — environment, health, hygiene, sanitation, appropriate technology, water management and use, education and training, and socio-political questions. It is in these areas that the IDRC is concentrating its research support.

One aspect of the water supply problem is technology. At the village level that usually means a hand pump, and the problem with hand pumps is that they very often don't work, largely because they are not designed for the type of intensive use they are getting. What is needed is an inexpensive, reliable pump that requires little maintenance and can be manufactured locally rather than imported. It might seem a simple requirement, but the fact remains that hand pump design has changed little in 100 years, and such changes as have taken place have been piecemeal modifications.

At the University of Waterloo in Canada a concerted effort is underway to design prototype pumping systems specifically for use in developing countries. The research team, supported by an IDRC grant, is concentrating on reliability under strenuous use, simplicity and low cost. Complete prototype systems will be supplied to researchers in developing countries for field testing and possible local manufacture. In addition the Waterloo team will develop a uniform guide for pump testing in order that an accurate assessment can be made of a pump's performance under conditions of actual use in rural areas.





*Water supply in the marketplace at Blantyre, Malawi — what is needed is an inexpensive, reliable hand pump.*

The same principles apply to another water technology project supported by the Centre, this one in Peru, where an evaluation of a new simplified water treatment plant is being undertaken. The plant is one of three developed by the technical assistance arm of the PanAmerican Health Organization (PAHO), which is concerned with making water treatment plants available to smaller communities in developing countries by reducing operation, maintenance and import costs to a minimum.

The experimental El Imperial plant in Peru incorporates a simplified technology that eliminates the need for pipes, pumps and any type of mechanical equipment. Only one part, the pressure feed chlorinator, is imported. The evaluation involves collecting extensive data on the plant's operation, programming the data through a computer to test the plant's efficiency, and determining what further modifications are needed so that construction and operation costs can be reduced still further.

For the really small community, however, the problems are more basic. In Nigeria an estimated 70 percent of the people live in communities with less than 1,000 population. Perhaps 10 percent of these people have access to "safe" water supplies — and because it is easier to provide water to larger communities, they have usually been passed over in water supply programs. These smaller settlements are the target of a project just begun by the University of Ibadan with the support of the IDRC.

The aim of the project is to devise appropriate technical and management strategies for improving water supplies at the village level. Since the availability and quality of water vary widely over the country, the multidisciplinary research team will operate in three representative areas. They will survey individual households and community leaders in 40 settlements to come up with a detailed analysis of existing water supply and use, related health factors, and the success or failure of any previous attempts at improvement. The survey will also provide field training for students from the University.

The data gathered will provide the basis for a proposed second phase of the project, which would lead to the development of alternative methods of improving rural water supplies. In view of the wide range of environmental conditions to be studied, the project could have application in many other African countries, and the Nigerian researchers have already established contact with other African researchers who could possibly become directly involved at a later stage.

Improved water supply alone will not yield full health benefits, however. Equally important is the safe disposal and treatment of wastewater and sewage, yet this is an area largely overlooked by both governments and donor agencies in developing countries. Most Third World nations cannot afford the high construction costs of conventional sewage disposal and treatment systems that are taken for granted in industrialized nations. Low-cost alternatives must be found for the traditional systems that pollute natural ground and surface waters and provide breeding grounds for disease-carrying insects and parasites.

In Tanzania, Ghana and Botswana the Centre is supporting research seeking such alternatives. Although the three are separate projects, their objectives are similar in many respects, and they comprise an informal network of researchers linking the different regions of Africa. Their common objectives include the study and adaptation of existing technology and methods, and the dissemination of information based on their findings — both nationally and internationally.

The IDRC was instrumental several years ago in bringing together a number of international organizations to form the Ad Hoc Working Group for Rural Potable Water Supplies and Sanitation, with the aim of promoting

## Pond power!

Sri Mrisa is the president of the Biraharekrishnapur village council in the east Indian state of Orissa. He is very proud of the village's three fishponds. Until about a year ago the ponds were used for drinking water, washing, laundry, and some fish harvesting. On an average year the fish taken from the ponds brought in about 1000 Rupees. This year, says Sri Mrisa, the fish harvest brought in more than 22,000 Rupees.

The reason for the sudden dramatic increase in both the quantity and quality of Biraharekrishnapur's fish can be summed up in one word: polyculture. Fish farming has long been a tradition in rural India, but the traditional use of only one fish species in a pond resulted in poor yields, usually about half a ton per hectare of pond annually. Scientists at the Central Inland Fisheries Research Institute (CIFRI) found that polyculture — a combination of species with different feeding habits — plus proper pond fertilization and management, could produce a tenfold increase in yields.

These experiments however, were carried out under controlled conditions in the Institute's own ponds. Would

they produce the same results in remote villages? CIFRI approached IDRC for a grant to fund a demonstration and testing program in Orissa and West Bengal. Biraharekrishnapur was one of the villages selected.

The first step was to clear the ponds of unwanted fish, using an inexpensive locally developed process that works within 24 hours. Then the ponds were re-stocked with six species of carp — the Indian carp Catla, Rohu and Mrigal, and the exotic Silver, Grass and Common carp. Some are surface feeders, some column feeders and some bottom feeders. The ponds were fertilized once a month with manure and superphosphate. The villagers were entirely responsible for stocking, fertilizing and managing the ponds — CIFRI provides only technical advice and encouragement.

At the end of the first year the yield was 3.5 tons of fish per pond hectare — a success story that has been repeated in dozens of other villages in the two states as the CIFRI teams move on to a new set of villages each year.

Perhaps the most encouraging sign is that the villagers almost invariably opt to plough the extra money back into the community. In Biraharekrishnapur they will no longer have to use the ponds for drinking and washing water — Sri Mrisa says the 22,000 Rupees will be used to sink a 150 foot well and pump up clean, fresh water.



improvements in this important field through a global program of information, education, research and training. The Centre also agreed to become the Group's "lead agency" for information activities.

In Peru the Centre is supporting research at CEPIS (the PanAmerican Centre for Sanitary Engineering and Environmental Sciences) to develop plans for a regional information system with special emphasis on rural water supply and sanitation, to serve Latin America and the Caribbean. Once operational, such a system could well serve as a model for a specialized global information network that would be an essential component of the Group's overall program.

The need for information and education is paramount if health is to be improved in rural areas. It has been observed that parasitic and infectious diseases such as hookworm, typhoid, cholera and dysentery persist in small rural communities even where a supply of pure water is available. The problem is poor hygiene — water becomes contaminated when stored in unsanitary containers, and diseases are passed quickly from one family member to another if basic preventive measures are not taken.

In Guatemala a team of researchers supported by the IDRC is studying the domestic routine of families in such villages. They hope, by winning the confidence of the people, to be able to isolate the cycle of contamination and infection — a cycle that results in a staggering 96 percent of the people in some areas being almost continuously subject to debilitating disease. If they succeed, their findings will enable other researchers to detect similar health risk situations, and to develop programs of sanitary education tied to water use in the home that will break the cycle of disease.

Funding was also approved at the close of the year for the establishment of a six-country network that will link Africa, Asia, Latin America and the Middle East in a study of wastewater disposal. The six projects will concentrate on the potential of stabilization ponds in the treatment of wastes, and the possibility of making sewage disposal profitable by using the ponds for fish production.

Aquaculture, or fish farming, is a traditional practice throughout much of Asia. Fish are often raised in community ponds that also serve as a supply of water for washing and drinking. Such systems are obviously inefficient in many respects. Properly maintained and stocked ponds are capable of producing far larger quantities of fish — and providing money to pay for a clean water supply, as happened in one Centre-supported project in India (see box).

The Indian project is part of a network of aquaculture projects the Centre is supporting in Asia. The most recent of these is in Singapore, where the government is making a determined effort to reduce the island's dependance on imports for 75 percent of its fish by developing intensive fishculture systems. The project will concentrate on management and disease control, induced breeding techniques, and the development of fish feed technology.

The success of the three-year project could have far-reaching consequences for the development of aquaculture in the tropics, especially in island communities.

Another field in which India and Singapore share a common concern is that of population. Too many people place too great a strain on water supply and sanitation systems, as well as other vital resources. Not surprisingly, both countries are leaders in the field of family planning and population research. In recent years the IDRC has supported a series of studies of Singapore's population policies, and this year approved a grant that will enable Indian scientists to continue development and testing of an experimental contraceptive vaccine.

The vaccine, developed entirely by Indian scientists at the All-India Institute of Medical Sciences, has been hailed by Western scientists as a "major breakthrough in biomedical research". Further testing is vital, however, and

## Tropical diseases can be beaten



*It is estimated that about one million children die of Malaria in Africa each year.*

Fifteen years ago there were about 60,000 known cases of malaria in India. In 1975 there were about four million. In Africa about one million children die of malaria each year, and about one adult in four suffers from malaria fever at some time. Worldwide there are about 200 million malaria sufferers.

What has happened is that the parasites that cause the severest form of the disease have developed resistance to the major anti-malarial drugs, and the mosquitoes that carry the parasites have developed resistance to many insecticides. It is a deadly combination. Dr Adetokunbo O. Lucas, former president of the Nigerian Medical Research Council, says that the disease is now so deeply entrenched in the environment in some parts of the world that insecticides and drugs have no real effect.

Dr Lucas is optimistic, however, that malaria and other tropical diseases that affect a total of one billion people in the Third World, can be beaten. He now heads the World Health Organization's Special Programme of Research and Training on Tropical Diseases, an internationally funded cooperative effort that for the first time puts research into tropical diseases on something like an equal footing with other fields of medical research.

The concept of such a program was enthusiastically endorsed by members

of the World Health Assembly early in 1975. The same year the IDRC, as one of the earliest supporters of the idea, was instrumental in bringing together groups of scientists to assess the current global research capacity and to develop the specialized task forces that are the Programme's front line weapons.

There are several of these task forces — working groups of top scientists — and each is concentrating on a specific problem. The Programme itself is not concerned only with malaria, it will also tackle other major tropical diseases such as leprosy, schistosomiasis (snail fever), onchocerciasis (river blindness) and trypanosomiasis (sleeping sickness). It was in malaria research that the first breakthrough came, however, when Dr. William Trager of the Rockefeller University of New York succeeded in maintaining a laboratory culture of *Plasmodium falciparum* for several months. This is the first time a continuous culture of any of the malaria parasites has been maintained for any length of time, and represents a significant step towards the development of an anti-malarial vaccine.

The IDRC is continuing to support the Special Programme, which now also has pledges for long-term financial support from many other countries and institutions around the world.



this will be carried out under the auspices of the International Committee for Contraception Research (ICCR) in six countries over a period of several years.

The hCG vaccine, as it is known, acts against a hormone called human chorionic gonadotrophin (hCG), preventing the completion of the fertile cycle that is essential for a successful pregnancy. There is also a strong possibility that the vaccine may be effective in the treatment of cancer in women and men, an aspect that also requires further study.

The project is part of a major international effort centred on the work of the ICCR, which has established a collaborative worldwide network of adequately supported scientists to develop new forms of contraceptive technology. The IDRC is supporting several parts of this program.

In the semi-arid tropics, a region in which the Centre has consistently supported a great deal of research, the farmer needs a reliable source of irrigation if he is to improve his situation. Yet the development of large-scale dams and irrigation schemes for purely socio-economic gain, without regard for the implications to health, often brings misery and disease to the rural people also. Tropical diseases carried by insects that live by the water or parasites that live in it already affect millions of people in rural Africa. Man-made lakes and waterways often help to make these diseases even more widespread.

Until very recently, research to combat tropical diseases has received very little support, but in 1975 the World Health Organization, assisted by the IDRC, began to draw up a special program for tropical disease research. At the end of 1976 the program was approved by the World Health Assembly, and it is already beginning to produce some promising leads (see box).

The battle against disease is one aspect of the problem — there is also a need to know more about irrigation: how water behaves in different soils, how much water different crops consume, and more about irrigation technology and equipment. Nowhere is this need more acute than in the semi-arid tropics. In 1975 the IDRC provided a grant to establish the International Irrigation Information Centre (IIIC). Its aim: to collect and evaluate information about the use of water on the farm, and to make that information available to the people directly concerned: farmers, researchers and extension workers.

It was a pilot project, based in the Middle East, where much of the research in this field is carried out. During the first year the embryo centre achieved its preliminary goals, and this year the IDRC approved a further three-year grant that will enable the IIIC to consolidate its position and seek additional funding from other sources. Already the IIIC is publishing quarterly an irrigation newsletter and an annotated bibliography, both of which will be expanded. The first of a series of specialized reviews has been produced and the Centre's documentation service has attracted requests for information from over 30 countries.

So far this review has dealt only in passing with the work of the people who make up the bulk of any rural population — the farmers. The largest percentage of the Centre's budget, however, is devoted to research in agriculture and food production, to helping improve the lot of the small farmer. This aspect of the Centre's work is the subject of the third and final section of this review.

# Farmers and Food

In the past year there have been signs that the world's spiralling rate of population growth has begun to decline. Not that the population is getting smaller, but that it is growing more slowly. Such a trend, if it continues, is encouraging, but it should not lead to any heady optimism, a sense that the problems are now as good as solved. Far from it. The fact remains that the global population is still increasing rapidly, and that even if it were miraculously to cease to do so overnight, there would still be millions of hungry people, malnourished people, starving people in the world. There would still not be food for everyone.

The majority of farmers in the Third World, however, are subsistence farmers. The subsistence farmer knows nothing about global trends, his concerns are more immediate: to grow enough food to feed his family, and, if luck is with him, to have a little left over to sell at the market. For him, his family and his neighbours, a bad year is not just a disaster, it is a tragedy.

In this situation change, any kind of change, is a risk — perhaps too great a risk. Yet his very subsistence is in itself testimony to his tenacity and traditional skills, skills that combined with the products of modern agricultural research could enable him to break out of the subsistence cycle. In its support of research into improving agriculture and food production, the IDRC has placed greatest emphasis on the small farmer, believing that a country's or a region's drive for greater self-sufficiency in food must begin here.

In Africa and Asia the Centre is supporting a network of projects concerned with cutting food losses through the improvement of postharvest systems.

In Senegal one of the most promising of these projects has just entered its second phase. During the first three years researchers at the National Agricultural Research Centre (CNRA) developed techniques for processing, drying and storing grains that are based on traditional methods and use local materials and labour rather than expensive imported equipment. Two young African scientists were also trained in postharvest research.

The second phase of the project will test the complete systems under real-life conditions in two Senegalese villages of different sizes. Simple mechanical threshers developed at CNRA will be compared with hand threshing. Storage racks that make maximum use of the sun and wind to dry the grain rapidly will be constructed from available materials. Grain storage trials will use both improved traditional bins and an innovative multicompartment silo



developed at CNRA and constructed from concrete blocks manufactured on the spot. In the larger village a cooperatively-owned mill will also be used, similar to one established in rural northern Nigeria in a Centre-supported project there.

The researchers believe that their findings will be valuable to almost all rural communities in West Africa, and once the final evaluation has been completed, a regional workshop will be held to demonstrate the results of the Senegal project to as many countries as possible.

Rice may be the Asian crop *par excellence*, but it is also widely grown by small farmers in other parts of the world, including West Africa. In Ghana a project began this past year that aims to adapt and test a pedal-operated rice thresher developed at the International Rice Research Institute in the Philippines under local conditions. Twenty of the machines will be made available to small rice growers whose farms are too small to qualify them for government assistance, such as the use of a combine harvester.

The project is being carried out by the Technology Consultancy Centre of Kumasi University. The researchers hope that by bringing simple mechanization within reach of the small farmers (who already produce 60 percent of Ghana's rice) they will not only increase rice production, but will stimulate an agricultural support industry to manufacture and maintain basic machines and equipment.

African farmers traditionally use the dried stalks of sorghum to build fences, granaries, even houses — the stalks are a useful by-product. Research into other possible uses of agricultural by-products is as yet limited, but the potential is enormous. In Egypt, for example, the four main crops — cotton, corn, rice and cane sugar — produce an estimated 8.3 million tons of by-products, yet this huge potential resource is largely unused, in spite of the fact that Egypt has a pressing need for animal protein, and currently must import feed for its livestock.

At the University of Alexandria a new project is being funded by the Centre aimed at increasing the country's meat production by making more efficient use of those agricultural wastes. The researchers will develop processing techniques to improve the digestibility and nutritive value of the by-products, and test the resulting feed supplements in trials at the University's experimental farm.

The three-year project will also involve training for a significant number of animal science students, and detailed economic studies of the newly developed feed production techniques. If the technology can be kept simple and inexpensive, its potential for use in many areas of the developing world can be imagined.

The IDRC grant will also enable Egyptian scientists to visit other projects tackling similar problems, including Mexico, where researchers at the National Council for Science and Technology have been studying the use of sugar cane as a cattle feed supplement for the past two years. The Centre recently agreed to fund a second two-year phase of this project, during which scientists will be able to test the full potential of the sugar cane based feed supplement, and assess the economic benefits to both the small farmer and the small sugar mill operator.

Diseases and pests that affect staple crops can also drastically reduce the food supply. Sorghum, grown by small farmers throughout the semi-arid tropics, is prey to the parasitic witchweeds of the *striga* family that can reduce the yield from a single sorghum crop by 50 percent or more, and eventually render the land unfit for sorghum cultivation. With IDRC support a new chemical treatment has been developed that may be able to destroy the

hitherto indestructible weeds (see box) and is now undergoing intensive field testing.

The root crop cassava is also a staple throughout much of Africa, Asia and Latin America. Almost since its inception the IDRC has supported a growing network of cassava research, with the emphasis on increasing production at the small farm level. Part of this effort is the search for an effective means of controlling the green spider mite, *Mononychellus tanajoa*, a tiny but extremely destructive pest that is particularly harmful to young cassava plants. The mite,

## An end to the witchweeds?

Sorghum ranks fifth among the world's cereal crops, and has the potential to do much better. In the semi-arid tropics it ranks second only to maize, and is a staple food for at least 400 million people. Scientists predict sorghum production could be quadrupled in developing countries, outstripping both wheat and maize.

But in Africa and Asia there are vast areas of arable lands where sorghum can no longer be grown. The reason is something the farmers call witchweed and the scientists call *Striga* spp. These are parasitic weeds. Their seeds may lie dormant in the soil for up to 20 years, to be activated only by a stimulant produced by the root of a suitable host plant — such as sorghum.



*Sorghum provides food for millions.*

Then the witchweeds reappear. Drawing nutrients from the host plants, they drastically reduce the sorghum yield, and produce beautiful yellow flowers that spread millions more seeds in the soil. Repeated attempts to grow sorghum on the land simply enable the witchweeds to multiply to the point where it is no longer worthwhile planting a sorghum crop.

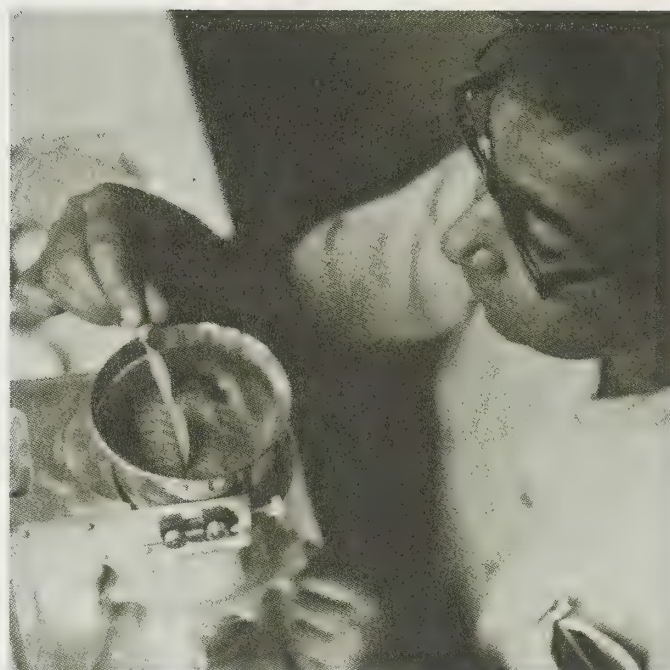
Since 1973 the IDRC has been supporting research at the University of Sussex, England, to develop a cheap synthetic stimulant that will cause the weeds to germinate prematurely — and die for lack of a host plant. The key is strigol — the chemical exuded by the roots of sorghum and some other plants, and only identified in 1972. If the scientists could develop a chemical compound with the same stimulant properties as strigol, and if it could be mass-produced economically in developing countries, a major constraint to sorghum production would be removed.

During the first four years of painstaking research, the group at Sussex, under Professor Alan Johnson, succeeded in producing synthetic compounds that will germinate the seeds of both *Striga* and another parasitic weed, *Orobanche*, in the laboratory. The Centre is now supporting a further two years of research to make the compounds more stable in a variety of soils, to develop pilot-scale production of the most potent stimulants, and to carry out extensive field testing in Egypt, India, Nigeria and Tanzania.

The aim now is to bring the new chemical to the point where it can be made commercially available to small farmers as rapidly as possible.



*A scientist at the Commonwealth Institute for Biological Control in Trinidad collects tiny mites from a cassava leaf.*



which is found in much of Latin America and the Caribbean, was accidentally introduced into East Africa some years ago, and, thanks to the mite's remarkable ability to drift long distances on wind currents, is spreading rapidly. It is feared it may soon cover the entire continent if unchecked.

For the past two years scientists at the Trinidad station of the Commonwealth Institute of Biological Control have been exploring the possibilities of using the mites' natural enemies to control them. They were able to identify and study no less than 14 predator insects that prey on green spider mites. The most promising of these will now take part in the second phase of the project, which will involve their controlled release in the actual environmental conditions of East Africa. Special quarantine facilities have been constructed by the East African Agricultural and Forestry Research Organization (EAAFRO). Here the scientists will release the predators and observe their effect on the mite populations, and on the cassava plants. They hope these studies will lead to a breakthrough in biological control that would be of immediate benefit to the small farmer whose cassava crop today is threatened by the spread of the mites.

The slash-and-burn shifting cultivation technique traditionally used by small farmers in the humid tropics is a wasteful system, since it depletes both the forest and the soil, and leaves large areas of land unused over many years. Before any large scale change can be made, however, it is necessary to understand more about agroforestry — the combination of food crops, trees and animals on the same piece of land — a field in which little research has been done. The IDRC is now supporting three closely related projects in Nigeria, Cameroon and Ghana that will greatly increase the available knowledge of agroforestry techniques in this region.

While the approach and methodology of each project will vary, they share a common general objective: to develop systems that will increase both food and wood production, improve the productivity of the land and provide greater income and security for the small farmer.

Agroforestry will be given greater international attention as a result of a study of research priorities completed by the Centre during the past year. The study, which was carried out by an international working group of experts, concluded that there is a great need for more research and more information on agroforestry, and recommended a coordinated international effort. The Centre convened a meeting of international donor agencies in November, at which a

committee was formed to establish the International Council for Research in Agroforestry (ICRAF), which will begin operations early in 1978.

In the semi-arid tropics small farmers face a different set of problems. Once the trees have been cut, they will not grow back unassisted, and without trees to provide shade and retain moisture the land may rapidly turn to desert. Since 1974 the Centre has been supporting a growing network of savannah forestry projects in the semi-arid regions of Africa, all of which have the common aim of preventing further depletion of treed areas and the resultant erosion of agricultural land. There are now 11 projects in the network. In order to gain maximum benefit from this concerted effort, the African researchers and administrators involved requested IDRC support in establishing, as a pilot project, a coordinating organization.

With IDRC funding for four years, the project will provide expert African research advisors who will visit each of the 11 projects several times each year, design training manuals and courses, prepare state-of-the-art reviews and generally ensure the effectiveness of the network. During the fourth year there will be an independent evaluation of the project's activities. It is a novel approach for this region of Africa, and one that could open up an entirely new strategy for the development of forestry in semi-arid areas.

The development of new varieties and new crops is another way in which small farmers can be helped to become more productive. Considerable progress has been made in recent years at the International Centre for the Improvement of Maize and Wheat (CIMMYT) in Mexico on the development of new lines of sorghum that will thrive at low temperatures. To consolidate this work the IDRC is funding a further two years' research in Mexico that will be carried out, at CIMMYT's request, under the supervision of scientists from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India, where the bulk of the world's sorghum research is conducted. Such a cold-tolerant sorghum would make the crop more widely available to small farmers in highland tropical areas of Asia, Africa and Latin America, and provide security for farmers who at present are faced with the prospect of severe losses as a result of a sudden cool spell.

CIMMYT has also been instrumental in the development of triticale, a hardy hybrid cross between wheat and rye. The true test of this new grain, however, is its ability to adapt to other regions of the world. The IDRC is supporting a number of triticale outreach projects that will help improve the grain's adaptability. In northern India, for example, where the foothills of the Himalayas provide a challenging testing ground, with a wide variety of agro-climatic conditions and little or no irrigation.

The Indian Council for Agricultural Research asked for IDRC support in expanding a small-scale triticale improvement program. The Indian scientists believe that triticale will be able to out-yield both wheat and barley in the unirrigated areas. The project will test a wide range of triticales in order to produce lines suitable to the region that are nutritionally superior to local grains, and, equally important, are acceptable to the local people for use in making products such as *chapati*, the unleavened bread that is a staple in many Indian homes.

Quinoa is not a new crop — in fact it is known to have been cultivated in the Andean region of Latin America in the time of the Incas. It is a member of the chenopod family, and is believed to be among the most nutritious grains in the plant kingdom. Quinoa is still grown by hillfarmers in Bolivia, Peru and Ecuador, but until recently there have been no attempts to develop it as a major crop. Now the IDRC is supporting a research program at the Bolivian Institute of Agricultural Technology to develop improved, high-yielding, disease-



resistant varieties that will allow an increase in production and reduce that country's dependence on grain imports.

The project will involve the collection, classification and selective breeding of the most promising varieties, and their introduction at the farm level. It will also provide much-needed training opportunities for young Bolivian researchers. For the farm families who scrape a precarious living from the Andean highlands, it will bring a better income and improved nutrition.

## Keeping ahead of the paper chase

Researchers in agriculture, forestry and fisheries write a quarter of a million new scientific and technical papers every year. Most of this research can be applied in many parts of the world, but because publishing and library services in developing countries are usually quite limited, there is a constant risk that research programs there will be launched in ignorance of work done elsewhere on the same subject. Western-based services involve costly duplication, require scarce foreign exchange, and often do not include important developing-country literature, especially if it is not published in scientific journals.

Helping developing countries to draw upon and contribute to the world's storehouse of agricultural knowledge can therefore have immeasurable benefits, and forms a major part of the IDRC's Information Sciences program. Transferring information among many disparate researchers in developing countries implies a systematic arrangement, recognized by FAO in its AGRIS, AGLINET and CARIS projects, which involve governmental participation.

AGRIS is a bibliographic system that, since January 1975, has been listing recent agricultural documents. Each participating country appoints a national centre to collect, classify and index documents produced within its territory — a job that in any case is vital for national planning purposes. The records from individual countries are sent in a standard form to the AGRIS Coordinating Centre where they are condensed into a printed bibliography, copies of which are distributed free to

participants. Centres with adequate computer facilities can receive the same information on magnetic tape and use it for specialized services tailored specifically to their needs.

By themselves, however, bibliographic references are useless: people generally need to read original documents. AGRIS is therefore accompanied by AGLINET, a network of cooperating agricultural libraries through which the original literature can be made available. The third system, CARIS, identifies and records agricultural research institutions, researchers and their current programs, enabling anyone to consult directly the source of any particular knowledge.

The IDRC's efforts to help developing countries participate in AGRIS have been concentrated on regional centres in Latin America and Southeast Asia, which collect literature from countries in their region, process it for input to AGRIS and provide various forms of output service. They also disseminate material that is important regionally but is not within the AGRIS subject scope. These centres provide a focal point round which national activities can develop and eventually branch off, so training is another important function.

The basic concepts of AGRIS developed out of INIS, an intergovernmental bibliographic system that has been successfully serving the nuclear energy industry for the past 10 years. Similar "mission-oriented" systems are either now operating, or are being considered, for population, education, development studies and other fields of direct concern to developing countries.

The rapid dissemination of information about recent research findings is vital to agricultural development, to enable scientists working in similar fields to coordinate their efforts, exchange ideas and avoid duplication of effort. The IDRC is already supporting the activities of specialized international agricultural information centres for cassava, grain legumes and farm irrigation, and during the past year approved a further grant to help establish a centre for information on sorghum and millet.

Since its inception the IDRC has committed about \$3 million to agricultural information programs. A good portion of this has helped developing countries participate in programs such as AGRIS, a computerized global system for information on agricultural science established by the FAO. As part of its continuing role in AGRIS, the Centre approved several grants during the past year (see box).

At a different level, there is an equally important need to find new low-cost techniques of communicating directly with the small farmer. In Uruguay the Centre is supporting a pilot project using small cassette tape recorders to bring the message of rural development to small isolated communities or individual farms, and to allow them to communicate with each other. Trained volunteers lead discussion groups through each pre-recorded program, and the people can record their reactions on the blank side of the tape, to be replayed to other groups. Feedback from many groups can be condensed and redistributed on new cassettes for further discussion and comment.

The aim of the cassette forum is to foster cooperative rural development activities among neighbouring groups. Initially the experiment is being tried in two areas of the country, but if it succeeds it could become a national program, and perhaps spread to other countries with similar problems that have already indicated an interest in such low-cost means of rural animation. For the farmers and their families it means, perhaps for the first time, regular access to new ideas, new attitudes and new knowledge.

The IDRC functions a little like the cassette forum — serving as a catalyst, bridging the gap between scientists, administrators and policymakers in different countries, different regions, different disciplines. Like the tape recorder, the Centre is in a sense a tool to be used by the developing countries, a tool that also can bring new ideas, new attitudes and new knowledge to help speed the development process.

It is that ability to continually produce and absorb new knowledge that differentiates man from the other inhabitants of this small planet. It is the search for new ideas, the drive for self-improvement, the need for common solutions that link our disparate cultures, that bring together Egyptians, Mexicans and Ethiopians, Ghanaians and Filipinos, Kenyans and Trinidadians. Here, too, we are on common ground.



# PROGRAM PROJECTS APPROVED TO MARCH 31, 1977 (1000's)

Region of Activity	PROGRAM DIVISIONS							
	Agriculture, Food & Nutrition Sciences	Information Sciences	Health Sciences	Social Sciences & Human Resources	Publications	Canada & Donor Agency Relations	TOTAL	% OF TOTAL
Africa	13,166	1,591	2,582	3,053	–	216	20,608	21.92%
Asia	16,830	4,616	5,368	9,743	114	–	36,671	39%
Caribbean & Latin America	8,307	1,806	4,051	4,832	–	–	18,996	20.20%
Global	864	2,417	2,554	4,711	–	–	10,546	11.21%
Canada	2,131	1,192	445	3,378	7	59	7,212	7.67%
TOTAL	41,298	11,622	15,000	25,717	121	275	94,033	
% OF TOTAL	43.92%	12.36%	15.95%	27.35%	.13%	.29%		100%

# PROGRAM PROJECTS APPROVED IN FISCAL YEAR 1976–77 (1000's)

Region of Activity	PROGRAM DIVISIONS							
	Agriculture, Food & Nutrition Sciences	Information Sciences	Health Sciences	Social Sciences & Human Resources	Publications	Canada & Donor Agency Relations	TOTAL	% OF TOTAL
Africa	4,888	248	203	416	–	216	5,971	22.35%
Asia	3,417	2,640	604	1,880	42	–	8,619	32.36%
Caribbean & Latin America	2,702	577	1,841	993	–	–	6,113	22.88%
Global	583	1,015	1,310	1,246	–	–	4,154	15.54%
Canada	486	–	105	1,207	7	59	1,864	6.98%
TOTAL	12,076	4,480	4,099	5,724	49	275	26,721	
% OF TOTAL	45.19%	16.77%	15.34%	21.49%	0.18%	1.03%		100%

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IDRC-003/76e,f

*IDRC Annual Report 1975-76 / CRDI Rapport annuel 1975-76*, Ottawa, 1976. 64 p.

IDRC-017e

*Natural durability and preservation of one hundred tropical African woods*, Yves Fortin and Jean Poliquin, Ottawa, 1976. 131 p. Also available in French (IDRC-017f).

IDRC-066e

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IDRC-067e

*Science and technology policy implementation in less-developed countries: the methodological guidelines for the STPI project*, Ottawa, 1976. 78 p.

IDRC-068e

*Education research priorities: a collective view*, Ottawa, 1976. 26 p.

IDRC-069e

*Low-cost rural health care and health manpower training: an annotated bibliography with special emphasis on developing countries (Volume 2)*, Frances Delaney, Ottawa 1976. 182 p.

IDRC-070e

*Walking on two legs: rural development in South China*, Elizabeth and Graham Johnson, Ottawa, 1976. 72 p.

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*Intercropping in semi-arid areas: report of a symposium held at the Faculty of Agriculture, Forestry and Veterinary Science, University of Dar es Salaam, Morogoro, Tanzania, 10-12 May 1976*, J. H. Monyo, A. D. R. Ker, and Marilyn Campbell, editors, Ottawa, 1977. 72 p.

IDRC -077e

*Tsetse: the future of biological methods in integrated control*, Marshall Laird, editor, Ottawa, 1977. 220 p.

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*Proceedings of the fourth symposium of the International Society for Tropical Root Crops held at CIAT, Cali, Colombia, 1-7 August, 1976*, James Cock, Reginald MacIntyre, and Michael Graham, editors, Ottawa, 1977. 277 p.

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*Computer simulation of soil-water dynamics: a compendium of recent work*, Daniel Hillel, Ottawa, 1977. 216 p.

IDRC-TS3e

*Optical character recognition: use of OCR techniques in decentralized data collection for bibliographic information systems*, H. W. Groenewegen and J. Marshall, Ottawa, 1976. 96 p.

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*Approaches and priorities in rural research in India*, V. S. Vyas, Ottawa, 1977. 12 p.

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*Evaluation of the CARIS project*, Ottawa, 1977. 32 p.

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*IDRC library thesaurus*, Ottawa, 1976. (various pagings). Also available in French (IDRC-LP6f) and Spanish (IDRC-LP6s).

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*The IDRC Reports/Le CRDI Explore/CIID Informa*

(Bob Stanley, Editor-in-Chief)

Published in three separate language editions, this is a quarterly magazine about the work supported by the International Development Research Centre and about related activities in the field of international development, and is available on request from the Centre's Publications Division.

*IDRC Features/Reportage CRDI*

This monthly news features service on scientific, technical and educational subjects pertinent to development, is provided free of charge to selected newspapers and magazines in the developing world.

*A complete list of current IDRC publications in English, French and Spanish is available from: Distribution Unit, Publications Division, IDRC, Box 8500, Ottawa, Canada. K1G 3H9.*

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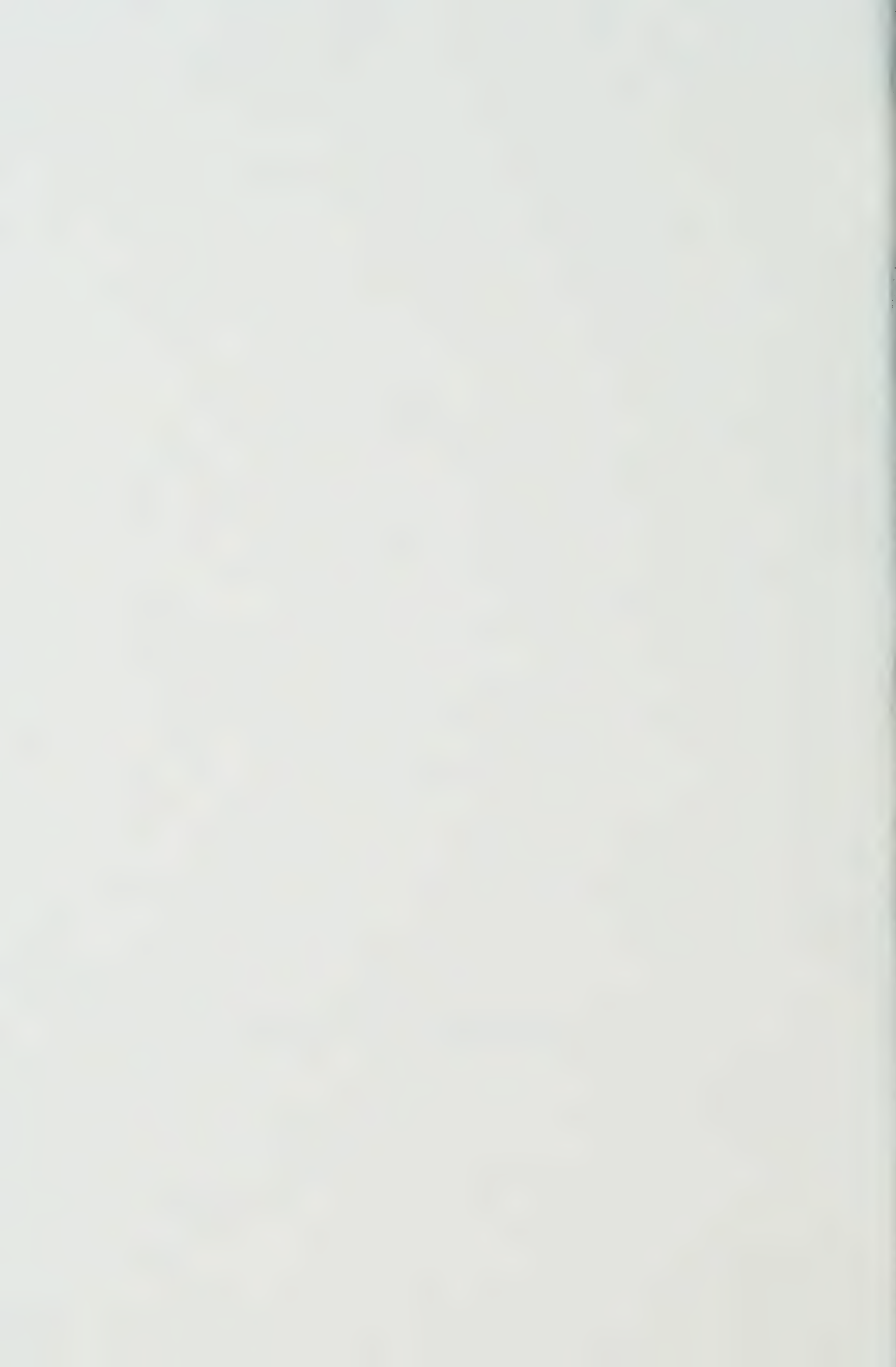






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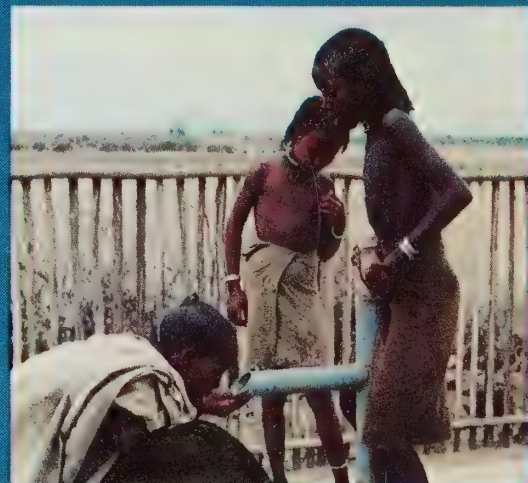




Review of  
IDRC activities  
1979

# Searching

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# Searching



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*IDRC President Ivan L. Head sees "learning modules" in action in the Philippines.*

As 1980 commences, most of the people of the world remain poor. In broad terms, little progress has been made in reducing worldwide the number of persons who exist in abject poverty. Quite clearly, the Second Development Decade has not met the expectations created at its outset 10 years ago. Yet the decade has not been a total failure. Much has been learned about the development process. Properly employed, the knowledge can contribute a good deal to the solution of the problems that beset so much of the world.

It is now increasingly accepted, for example, that healthy, educated people are the most effective of all development instruments; indeed, are the only effective development instruments. Such persons are capable of making wise choices. Increasingly, they have the means and the incentive to solve problems. They become the architects of their own improved future. The human condition is more than the beneficiary of development; it is the primary engine in the exercise.

Time is a critical element in this exercise, for between North and South there now exists a developmental divide. Its existence is reemphasized in every session of the United Nations General Assembly and in virtually every inter-governmental conference. In no other direction and over no other issue does there exist such a definite and seemingly insurmountable barrier. Again and again, its existence foils activities designed to create a degree of international concord.

More significant than the failure of governments to reach agreement across the divide, however, is the popular mood of indifference now so prevalent in the North and the sense of frustration now so evident in the South. This combination damns the efforts of even the most determined and encourages agitators and adventurers. It is no coincidence that unrest and instability are found almost exclusively in the Third World.

To surmount this developmental divide, there is required a measure of human involvement in the North and a measure of human benefit in the South. In short, a perception of the human condition much more intimate and much more subjective than that found in many of the earlier, macroeconomic, development treatises. A dedication to the immediate: to the practical problems that deny to human beings better health, better nutrition, better shelter, better education.

Research can lead to those results, but the research must be rooted in the needs of the developing countries. It must reflect their needs, employ their skills, reflect their priorities. And in the process it must enhance their indigenous competence.

The International Development Research Centre was created to assist in that process. This booklet tells the story of how the Centre is going about its task.

Ivan L. Head  
*President, IDRC*







**When was IDRC set up?** The Centre was established by an Act of the Canadian Parliament in May 1970. The first meeting of the Board of Governors took place in October 1970.

**Why was it set up?** In the words of the Act “to initiate, encourage, support and conduct research into the problems of the developing regions of the world and into the means for applying and adapting scientific, technical and other knowledge to the economic and social advancement of those regions.”

The Centre was established as a public corporation so that it would have the greatest possible measure of flexibility and autonomy while still being accountable to Parliament. Its funds are in the form of “untied aid,” which allows it to secure the best available professional skills and to finance projects in the most appropriate way regardless of the origin of the research workers and the source of equipment.

To increase the problem-solving capacity of developing regions, IDRC places heavy emphasis on support for research workers living and working in the region. The great majority of projects are being carried out in the developing countries under the direction of a local scientist or administrator. Some research is financed by the Centre in Canada, at universities and elsewhere, in support of field projects in the developing regions. Most projects include a training element, and the Centre’s Human Resources Awards Program also provides for the training and development of young professionals.

*A volunteer teacher conducts classes at an experimental Egyptian village school.*

**How much has been done?** From October 1970 to March 1979 the Board approved support for 849 projects and supplementary grants in 100 countries at a total cost of \$154 million. A few projects involve expenditures of more than \$1 million, but others involve less than \$5000; the average grant is less than \$200 000. Some 332 projects have been completed.

**What are the principal sectors in which research has been supported?** Four program divisions are responsible for developing and supervising research support. They are Agriculture, Food and Nutrition Sciences; Health Sciences; Information Sciences; and Social Sciences.

**How international is IDRC?** The Board of Governors consists of 11 Canadians and 10 non-Canadians. Six Governors are drawn from developing countries.

The Centre has regional offices in Singapore, Bogota, Dakar, and Cairo — all of which are headed by nationals of the region.

**How does it fit in with the work of the Canadian International Development Agency?** There is no formal relationship between CIDA and IDRC. IDRC has been the managing agent for several CIDA grants in agricultural research. Staff from each organization attend the other’s project review committee meetings. In general, IDRC supports the more innovative and risky research and passes to CIDA proposals for larger-scale support of projects incorporating proven new technologies.







In the field of development everything connects. With almost mechanical precision one problem leads surely to another, and another, and another, until the circle is completed.

Take overpopulation, for example. Overpopulation leads to food shortages, which lead to malnutrition. Malnutrition leads to poor health and susceptibility to disease, especially among infants. High infant mortality may be compensated for by high birth rates, meaning more mouths to feed — in a word, overpopulation.

It is like an absurd game. Pick a problem, any problem, and it will lead you to another. Fortunately it also works in reverse: well-fed people are healthy people who can work their farms to produce the food they need to keep their families healthy. These are oversimplifications, to be sure, but they illustrate what IDRC has been attempting to do for the past 9 years: to help people to help themselves break out of the vicious cycle that is underdevelopment.

Later chapters in this *Review* deal individually with the work of the four program divisions in the search for appropriate solutions to the problems of the Third World. While reading them, though, bear in mind the connections. Malnutrition is a health problem and a social problem as well as an agricultural one. Water supply and sanitation may be the responsibility of the health scientists, but irrigation and fertilizer concern the agriculturists, and their use is a subject for study by the sociologists. The work of the information scientists cuts across all factorial boundaries.

The Centre's projects are grouped

*Improper water use: another link in the chain of underdevelopment.*



*IDRC exhibit at the Ontario Science Centre attracted all ages.*

under four divisional headings for operational convenience. These divisions are the component parts of an overall program designed to assist the countries of the Third World to adapt science and technology to solving their own problems. The underlying concept is now almost a decade old. That it is still a very contemporary concept was amply demonstrated by the amount of interest in the IDRC model shown by delegates to the United Nations Conference on Science and Technology (UNCSTD) in Vienna in August. And if imitation is the sincerest form of flattery, the Centre should be flattered by the similarities between its aims and those of the proposed new United States Institute for Scientific and Technical Cooperation.



What the developing countries asked for at UNCSTD was a new direction for scientific and technical aid programs during the 1980s and beyond. They called for action on the part of the developed countries to “support and

facilitate” their efforts to achieve development through “the establishment of endogenous scientific and technological capacities.”

The Conference secretary-general was Joao Frank da Costa, a Brazilian who



*Delegates at UNCSTD: “We must have our own science and technology.”*



heads his country's Office of Science and Technology. Mr da Costa believes that development means a lot more than just economic growth; it also involves a host of political, cultural, social, and other factors. So there can be no one

technological solution for all the developing countries.

"Each country must have its own science and its own technology," said Mr da Costa. "We are not really dealing with aid at the UNCSTD and we are certainly not dealing with charity. The idea is to make it possible to set up a science and technology structure in each developing country so that it can solve its own problems in its own way."

That idea paraphrases the IDRC's own objectives to "assist the developing regions to build up the research capabilities, the innovative skills, and the institutions required to solve their problems." Canada recognized the need 9 years ago and responded by establishing IDRC. At Vienna in 1979 Canada pledged fresh funds — up to \$12 million in time — to support closer cooperation between Canadian scientists and their Third World counterparts. The Government of Canada has invited IDRC to become "lead agency and national focal point" for this new program. That invitation has been accepted in principle by the Board of Governors and will be the subject of detailed discussions in the year ahead.

By sheer accident (for it was originally planned to take place a year earlier), UNCSTD was held during the UN's International Year of the Child. In any event, the timing was not inappropriate, for it served as a reminder of the connection between theory and practice. It does no harm for people discussing science and technology policies and programs to remember, for instance, that in the Third World one child in 10 will not live to see a first birthday, that 110 million children under age 5 live in poverty, that 160 million do not have enough to eat, that 140 million have no access to health facilities, and that fully half of the children of the developing world receive little or no schooling. Everything connects.

One of the slogans coined for the International Year of the Child sums it up in just eight words: "The future is theirs; the responsibility is ours." The search for solutions goes on.









## Agriculture, Food and Nutrition Sciences program

The Agriculture, Food and Nutrition Sciences Division is the largest of the Centre's four program divisions in terms of the number of projects it supports and the size of its project budget. Since 1970 the AFNS Division has had responsibility for about 40 percent of the Centre's project spending.

The arid and semi-arid regions of the developing world are the main target areas for the AFNS program, and its overall objective, simply stated, is to increase food production in these regions and, in doing so, to improve the health and economic well-being of the rural poor.

Thus there is an emphasis on research to improve the yields of traditional crops such as sorghum, millet, food legumes, oilseeds, and root crops. These basic crops, which provide subsistence for hundreds of millions of people, have been largely neglected by agricultural researchers in the past.

The Division is a member of the Consultative Group on International Agricultural Research, which supports a global network of specialized international agricultural research centres, and much of its research support is linked, directly or indirectly, to the work of these centres.

The Division's program of work is divided by discipline into five programs:

- Crop sciences, especially crops of the semi-arid tropics and multiple cropping systems;
- Animal sciences, with emphasis on livestock diseases and management, pasture improvement, and by-product utilization;

- Fisheries, mainly aquaculture, but including also artisanal fisheries, study of fish diseases, and utilization of neglected species;
- Forestry, particularly savanna forestry, agroforestry, and forest product utilization; and
- Postproduction systems for food processing, storage, preservation, distribution, and use in the home.



The Division has an associate director responsible for each program. The director is Joseph H. Hulse, who has held the position since joining the Centre in 1970.

### The year in brief

Sixty new projects for the AFNS program were approved during the fiscal year 1978–79, with grants totaling some \$11 million. Although the general organization of the program remains basically unchanged, there has been a continuing change in the emphasis and activities in some areas of research, such as the postproduction systems program and the animal and crop sciences program. Examples are highlighted elsewhere in this section of the *Review*.

Crop sciences continue to account for the largest portion of the Division's budget including, for instance, a food legume network and a cropping systems research network, which began in Southeast Asia, and is now expanding into the High Andes of South America, into Central America, and into Africa.

*Kenya: trees and food crops together can maximize the land's potential.*



Growing several different crops — together or in sequence — on the same piece of land during a single year is one way of increasing productivity. In Bangladesh, Sri Lanka, and Thailand, IDRC-supported projects aimed at designing and testing rice-based cropping systems for small farmers all began second phase operations during the past year. In the first phase researchers were able to increase the number and yield of the crops produced; in the second phase the successful experimental systems will be more widely tested and extended to large numbers of small farms. The researchers have made detailed studies of the economic and social factors that influence the adoption of new systems.

All three projects are part of the cropping systems research network coordinated by IRRI, the International Rice Research Institute in the Philippines, which pioneered much of the cropping systems research. A 3-year IDRC grant to IRRI will continue support for an outreach program to strengthen the interaction between the small farmers of Asia and the national and international scientists.

In Costa Rica and El Salvador the Centre is supporting a 3-year research program as part of an evolving cropping systems network in semi-arid areas of Central America. The aim is to maximize food production in a region that is at present unable to provide even the mini-

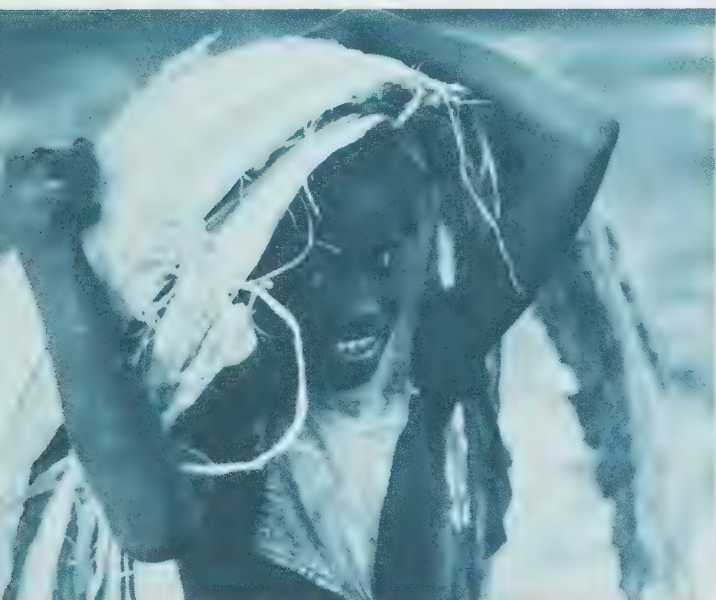


*Jamaica is one of several countries experimenting with raft oyster culture.*



mum requirements for an expanding population. In Africa a grant to the University of Swaziland will enable an interdisciplinary research team to examine the traditional mixed cropping systems used by African farmers. The team will develop improved systems to increase small-farm production not only in Swaziland but throughout most of the region.

In the area of fisheries, one of the most successful projects to date has been at the Southeast Asian Fisheries Development Centre (SEAFDEC) in the Philippines. It was here in 1976 that the milkfish was bred in captivity for the first time. That feat has since been repeated many times by scientists at SEAFDEC, and in the 3-year second phase of the



*The bark of the African baobab tree is a by-product that has many uses!*

project, now under way, they hope to improve their techniques to the point where a reliable supply of fish fry can be made available to the region's many milkfish farmers. Milkfish are of major economic importance to much of Southeast Asia, but their refusal to breed in captivity has long been a constraint to expansion of the industry. A related program on carp breeding in Malaysia has also been very successful in spawning carps in all months of the year, the first step toward domestication and genetic selections. Based on these successes, programs are being initiated to breed other indigenous fishes that show aqua-

culture potential.

In Africa, aquaculture projects in Egypt and the Sudan are now well under way, and, in Latin America, project personnel working in Peru, Ecuador, and Colombia on shellfish and mariculture production are organizing their field observations. The Guyana shrimp by-catch program has now entered a second phase, which is concerned with standardization of methods for large-scale production of stable fish products.

The forests of the Andean region of South America contain about 650 species of timber, of which as many as 400 may be of commercial value. At present, only about 50 species are used commercially, and stranger still, in a region where there is a growing shortage of adequate housing and an abundant supply of timber, wood is rarely used in home construction. In 1975 the Centre began supporting the first joint research project of the Andean Pact countries (Bolivia, Colombia, Ecuador, Peru, Venezuela) with the aim of developing the potential of at least 100 of the untried wood species.

The project, now nearing completion of its second phase, has already done much to determine the physical and structural properties of species available throughout the region and has provided the data needed to make better use of forest resources. The project has also created uniform standards for the region, helped to create new research facilities in three countries, and, perhaps most important, has stimulated the interest and commitment of governments of the region to a greater use of forest products.

The experience gained in the Andean Pact project will provide the basis for similar research in a new Centre-supported project in Mexico. Aimed at providing grading rules and design stresses for a large number of lumber sizes, the project will benefit from the services and knowledge of two Canadian experts and is expected to be only the beginning of a large program for the Central American region.



In the developing countries, animals — an important source of protein — compete with people for land and food. One of the main thrusts of the animal sciences program, therefore, has been to support research to develop livestock feeds from agricultural by-products. In Latin America, for example, researchers are feeding cattle diets based on the waste products from two of the region's major crops, sugarcane and coffee beans. In Egypt another project is using by-products from crops such as cotton, maize, rice, and sugarcane in experimental feeds, with some success. And in Kenya a project begun this year will help to increase rural poultry production by developing nonconventional feeds using agricultural by-products and wastes.

Another approach to the problem is the development of pasture legumes to make use of poorer soils that will not support food crops. Pasture legumes not only provide fodder for cattle and increase productivity but also improve the quality of the soil in which they are grown. IDRC has supported several research projects on pasture legumes since 1972 and in the past year approved a grant for a major pasture legumes research program to be carried out by the International Center for Agricultural Research in the Dry Areas (ICARDA), which was established with IDRC support in 1975. Through the development of pasture lands in the arid regions, an important step can be taken toward reducing the spread of the deserts.

*An Egyptian researcher watches dairy cattle eating by-product feed mix.*





## Legumes no longer neglected

Imagine a plant that grows rapidly, produces prolific quantities of high-quality protein, and has edible pods and leaves. For good measure, make the plant highly tolerant to stresses such as drought and heat, and give it the ability to extract nitrogen from the air, thus fertilizing the soil in which it grows.

So remarkable a plant, you might think, would have to be the product of highly developed modern agricultural research and technology. Not so. This “wonder plant” is the humble cowpea, which originated in Sahelian Africa thousands of years ago and has gradually spread throughout the tropics.

Nor is the cowpea unique. It is just one member of the family of food legumes that includes chick-peas, broad beans, lentils, pigeon peas, mung beans, and black grams, to name only a few. They share many of the same valuable attributes.

Food legumes are an important part of the diet of millions of the world's poorest people, for they provide the protein and essential amino acids that are otherwise lacking in diets based on root crops or cereal grains. Yet the improvement of many food legumes has been largely neglected by agricultural research until quite recently. And consumption of food legumes has actually declined in Africa and Asia — a cause for serious concern in regions where poor nutrition is often as much a problem as lack of food.

The world centre with responsibility for research to improve the cowpea is the International Institute of Tropical Agriculture (IITA) in Nigeria. In cooperation with IITA the IDRC is supporting pro-

jects in several West African countries as part of a program to test new, high-yielding, disease-resistant cultivars as widely as possible.

During the past year IDRC has also cooperated with IITA to produce a 16 mm film on the international cowpea improvement program. The 23-minute film, entitled *Pods of Protein*, is being widely shown to researchers, planners, and educators as part of the Institute's continuing efforts to encourage both production and consumption of cowpeas in the semi-arid tropics.

In the Middle East and North Africa, chick-peas, broad beans, and lentils are the principal legumes. In fact the broad bean is often known as “the poor man's meat” in this part of the world. Here the



*Food legumes are an essential source of protein for families in Africa.*



main centre for food legume research is the International Center for Agricultural Research in the Dry Areas (ICARDA), which also serves as a training centre for young scientists and technicians from the region. ICARDA maintains close links with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India, which has responsibility for pigeon pea and chick-pea improvement.

In IDRC-supported projects in Egypt and Sudan the main objective is to increase yields. Egypt is particularly hard-pressed because of the limited amount of land suitable for agricultural production. Broad beans are a staple for many people, but yields are generally low. Egyptian researchers, many of them trained at ICARDA, believe that production from the country's 200 000 hectares of food legumes could be doubled. They are concentrating on the problem of low yields, whereas in Sudan the main emphasis is on developing stable yields.

In Bangladesh a great deal of attention has been paid to rice research, but food legumes have again been largely neglected. Now IDRC is supporting the Bangladesh Agricultural Research Institute in a food legume improvement pro-

gram that will make use of the best of the local varieties as well as evaluate legumes from other countries that may be adaptable to conditions in Bangladesh. The Institute's researchers will receive training during the project at ICRISAT and IITA to enable them to take full advantage of the experience already gained in other countries.

Since 1971 the Centre has supported more than 30 projects dealing directly with food legume research. Because of the rapid growth rate of legumes (some varieties mature in 60–70 days), and their nitrogen-fixing ability, they are an ideal component for multiple cropping. They are often intercropped with maize, sorghum, or other cereals, or grown between the first and second rice crops. IDRC supports a worldwide network of cropping systems research projects, many of which include food legumes as a component, and, thus, benefit from the legume improvement program.

The greatest benefit however goes to the rural poor of the developing world, especially to the children, for it is they who are usually the first victims of malnutrition. Food legumes mean protein and, in turn, a more balanced diet and ultimately healthier children.



*Intercropping cowpeas and maize at IITA in Nigeria.*



## Getting the harvest home

In the past 30 years agricultural research in the developing world has made remarkable progress. Scientists have developed new varieties of cereals that provide higher yields, mature earlier, and are resistant to certain pests, diseases, and drought. Research has also resulted in improved cropping practices, such as multiple cropping, intercropping, and new crop rotation techniques, which have added greatly to the crop yields.

The beneficial impacts of these advances are, however, to a great extent offset by the tremendous losses that occur during and after the harvest. In some countries these losses are estimated to be as high as 30 percent of the total food production. You do not need to be a mathematician to calculate that farmers who lose one-third of their crop this way must increase production by 50 percent simply to replace their losses.

If the farmers could somehow reduce postharvest losses, their food supply would increase dramatically even without increased production. This seemingly obvious fact was, for a long time, largely ignored by researchers and administrators. Since its inception, IDRC has been one of the leaders in encouraging and promoting research into postharvest technology. The Centre pioneered an integrated approach to reducing postharvest food losses, in what is now known as the postproduction systems (PPS) program.

The program supports research on all stages in the food system from the moment the harvest is in — whether it be rice or fish, fruit or nuts. The basic stages include threshing, drying, storage, processing, transportation, marketing, and utilization.

Sorghum, for instance, must first be dried. Then it is stored until needed, when it is threshed and milled, either by hand or by machine. The sorghum meal may have to be stored again, it may be marketed at this stage, or it may be used to bake bread for sale at the market to meet the growing demand for prepared foods. At any of these stages it may have to be transported — from field to storage, from storage to mill, from mill to market, and so on. It is a complex process.

One of the earliest projects in this program was the development of a pilot commercial grain milling system at Maiduguri in Nigeria. The aim was to develop a viable mill that could process local



*Village-scale milling technology is being adapted for use in Botswana.*



grains into a product as good as, or better than, that produced by the traditional process and thus reverse a trend toward buying imported, processed grain products. With technological assistance from both the University of Saskatchewan and the National Research Council of Canada's Prairie Regional Laboratory, a milling system, revolving around a dehuller that can handle most indigenous grains, was developed at Maiduguri. A test kitchen and bakery were added at a later stage, and the government of Nigeria has now established a second mill at Kaduna as a prelude to a string of such mills throughout the country's grain-producing areas.

Much of the experience and some of the technology developed in the Maiduguri project are now being further tested and adapted in two projects in Botswana. The government's ambition is to attain self-sufficiency in grain production — an ambition that demands not only commercial but also village-scale milling operations. The village mill being developed is a scaled-down version of the one used on the larger project. It will be tested at three different sites under the management of the villagers themselves. If successful, the mill will be of particular value in many developing countries, where the farmers want to grind small quantities of grain for their own use.

Energy is also an important factor in the postproduction system. Many of the processes used in the industrialized nations have a high energy requirement that makes them extremely expensive. The Centre is supporting research to develop appropriate methods, such as the use of solar energy for drying fruits and vegetables in Egypt, potatoes in Peru, onions in Niger, and fish in Mali.

Another source of energy is waste products. Examples are the use of rice husks to fuel a mechanical grain dryer and the use of coffee pulp in the production of methane to fuel a crop dryer.

Wherever possible, IDRC aims to improve existing technologies rather than replace them with new ones. This is very

evident in a research project in Senegal. At the Bambey Agricultural Research Station, there is a unique collection of grain storage bins. Patterned on traditional designs borrowed from all over the region, many feature simple modifications that greatly improve their efficiency. The aim of the first phase of this project, started in 1973, was to find practical, inexpensive technologies for drying, storing, and processing grain. In the present second phase, the developed techniques are being tested where it counts — in the villages. The components have been combined into two "packages" — one for large and one for small villages.

In the villages, children are usually the first victims of malnutrition. For the malnourished child, minor illnesses are potential killers, and the child is never more vulnerable than when being weaned. In three Thai villages, the Institute of Nutrition of Mahidol University, supported by IDRC, has set up experimental food processing centres where parents can make infant foods. Recipes are being developed using locally produced legumes and vegetables, and after the experimental period, it is hoped to expand the program into 26 provinces designated "nutrition priority" areas.

Several research projects are under way to develop economically feasible, suitable technology for the small farmer. These projects have been set up in such a way as to ensure as much as possible that the resulting implements can be manufactured by small-scale industries or local artisans from available materials. This will provide needed off-farm employment and reduce the dependence on imported equipment, much of which is expensive and impractical for the small farmer.

The postproduction systems program brings together all these elements in an integrated program with the aim of making the best possible use of all the food the farmers can grow. A full account of this program is given in a newly published IDRC booklet *Food Systems* (IDRC-146e).

## Information Sciences program

IDRC is one of the very few development assistance organizations to have a program and budget specifically devoted to the information sciences, which has permitted it to become something of a leader in this field. During the 1978–79 fiscal year the Information Sciences Division supported 20 new projects and, over the past 9 years, has been responsible for about 12 percent of the Centre's project budget.

The work of the Division is wide ranging, and its choice of subject areas often reinforces the activities of the other three program divisions:

- Support for international information systems, either global or regional, with particular emphasis on assisting developing countries to participate in, contribute to, and benefit from such systems;
- Support for specialized information centres dealing with topics of importance to international development;
- Improvement of library services, including operation of IDRC's own library to serve as a resource for both the Centre and the development community;
- Industrial extension services, especially for small-scale or rural-oriented industries in developing countries;
- Cartography, especially the development of teams to apply the data obtained from satellites in order to produce thematic maps; and
- Computer science, the application of data-base management systems to the



storage and retrieval of information in developing countries.

The director of the Division since its inception has been John E. Woolston.

### The year in brief

International cooperation in information work has remained the main focus of the Information Sciences Division over the past year, particularly through cooperative bibliographic information systems. The "territorial formula," by which each participating country processes only its own documents, results in an equitable sharing of costs. In return for contributing its bibliographic records to the system, the country gains access to the literature of the rest of the world.

The program provides support mainly to regional centres acting on behalf of their member governments. The Agricultural Information Bank for Asia, which is linked to AGRIS, the FAO's global agricultural information system, has received an IDRC grant for a third phase of operations. Like its counterpart in Latin America, the Asian network is adding to its previous activities, making greater application of computer methods and building new services to deliver documents in response to specific requests.

In the field of population information, the regional centre for Latin America received a second IDRC grant. The objective of the second phase is to decentralize some of the document collection and recording activities to national cooperating institutions. A first grant



has also been awarded to an African regional centre for population information.

Both of these centres could eventually form part of a worldwide population information system, POPIN, the design

in defining a program to be known as DEVSIS Africa.

In a large project covering the information from all sectors in one geographic region, IDRC joined several other donors



*Latin America is a leader in documenting basic population information.*

of which was studied in some detail by the United Nations Population Division with the assistance of an IDRC staff member seconded for the purpose.

For the information needed by development planners and policymakers, IDRC is continuing a demonstration of the proposed Development Sciences Information System (DEVSIIS). In the last year, the demonstration has resulted in a joint bibliography and index to the Canadian and West German development literature.

At the same time, several other countries have been producing indexes to their own development literature and several are joining the demonstration managed by IDRC. Meanwhile, with IDRC support, the Economic Commission for Latin America has launched a similar demonstration with the participation of 10 ministries of planning. At the request of the Economic Commission for Africa IDRC managed a group of consultants

in funding the planning stage of an information network for the Sahel. The project is intended to enable the eight member countries of the *Comité Interétats de Lutte contre la Sécheresse Sahélienne* to share information pertaining to the common problems of the Sahelian drought and at the same time to help them develop national information policies and infrastructures.

In addition to the documentation aspect of international information systems, the Division also continues to support the use of a common computer system for bibliographic manipulations. ISIS, a package of computer programs originally developed by the International Labour Office for information retrieval and library management, is now used by many institutions, both national and international, some of which have drawn on IDRC for technical advice.

ISIS resource centres have also been established in Pakistan and Costa Rica,

both with some assistance from IDRC. These will serve as sources of expertise, as training centres, and will also process records from international and regional systems.



*Microfiche storage unit in Tunisia contains thousands of publications.*

For its own bibliographic processing in Ottawa, the Division has now been operating for more than a year with MINISIS. This is an ISIS-related bibliographic system, designed by the Centre's computer scientists, and is described in more detail elsewhere in this section of the *Review*.

MINISIS is also being used in Ottawa to produce several special bibliographies, including *Devindex*, the index of the DEVSIS demonstration, and SALUS, a bibliography on low-cost health care and health manpower training. The documents listed in these bibliographies are now being reproduced on microfiche so that a complete collection can be donated to appropriate institutions at the same time as the records on computer tape. The microfiche unit set up for this purpose can also provide single microfiche copies on request to institutions that have the facilities to "read" these postcard-sized pieces of microfilm. The cost savings in mailing alone for this type of document distribution are remarkable.



*Learning to use MINISIS: it's a "user friendly" computer system.*





## Minicomputer cuts problems down to size



It is certain that somewhere in the developing world, perhaps in different countries, maybe even on different continents, right now two independent teams of researchers are diligently attempting to solve the same problem.

They are doing this, not because they are in competition — quite the reverse — they are doing it simply because neither team is aware of the other's existence. It is also more than probable that the solution to their problem has already been found by another research team in another country.

The situation exists in reality hundreds of times over, and it illustrates the importance of rapid communication among scientists. Developing countries, with their scarce resources and limited research capacity, can ill afford the waste of time and money that results from such duplication of effort, nor for that matter, can the industrialized countries, with all their resources.

The answer is global information networks that carry the latest research data swiftly from one country to another. One of the most advanced of such networks is AGRIS — the international information system for the agricultural sciences and technology. Operated by the UN Food and Agriculture Organization, AGRIS was established with considerable support and assistance from IDRC. It became fully operational in 1975 and now handles more than 100 000 “pieces” of information each year.

The principle behind such systems is simple. Each country (or region) puts in all the data it has available and, in return, gains access to all the data avail-



able from other participating countries. Because of the sheer volume of information, such systems must be computerized to operate efficiently, and, in the past, this meant high costs in computer equipment and programs. What was needed was a small computer with a program that could cope with a big job at a relatively low cost. IDRC's computer scientists undertook to try to develop such a package.

It took 2 years, and the end result was MINISIS, "a minicomputer based information management system." The name is derived from ISIS — Integrated Set of Information Systems — developed earlier by the International Labour Office for use with a full-size computer. MINISIS performs all the same functions but on a much less expensive minicomputer.

The MINISIS package offers many advantages in addition to low cost; perhaps the greatest is its versatility, which enables it to be used for many different applications, including many library management functions. Also important, MINISIS is what computer scientists call a "user friendly" system. In other words, it is easy to learn, even for those with little or no experience of computerized information systems.

In fact, MINISIS is such a good system that it has attracted considerable interest not only from the developing countries, as was intended, but also from governments and institutions in the industrialized nations — including Health and Welfare Canada. Most significant of all, the ILO is planning to replace its ISIS with MINISIS, at considerable savings.

In short, MINISIS is a breakthrough in bibliographic information processing. But if the developing countries are to be able to benefit from this advance, they need to be able to obtain experience with the system through on-the-job training. To provide this, IDRC hopes to establish MINISIS resource centres at strategic locations around the world, preferably at institutions that already have major programs of information processing and computer science, and, where possible, in association with postgraduate schools of information science.

Considerable interest has been shown by the francophone countries of Africa — in fact Tunisia and Zaire have already acquired minicomputers with the intention of installing MINISIS programs. Specialists from both countries spent 2 weeks in Ottawa being trained on the Centre's minicomputer. In response to the interest from francophone developing countries, the Information Sciences Division earlier this year drew up a 2-year project to provide training and documentation for MINISIS in French and to ensure a capability for implementing and maintaining the program on minicomputer installations in francophone countries.

Computer science is advancing rapidly, and it is quite conceivable that the minicomputers will eventually be overtaken by the advent of microcomputers, which will be even less expensive. If and when that happens, many of the developing nations will already have gained the experience with MINISIS that will enable them to continue taking advantage of the latest technology.

## Social Sciences program

Second largest of IDRC's program divisions, accounting for almost 30 per cent of the project budget over the past 9 years, is the Social Sciences Division.

The social sciences program is concerned primarily with the planning and implementation of development: how people are affected by the development process, how they respond, and why. Such information is vital to the preparation of effective plans and policies to bring about rapid development.

The Division's research support is focused in four sectors:

- Economics, concentrating particularly on economic policy and its impact on development, agricultural development, impact studies, labour supply and employment, and regional development studies;
- Education, including research related to the basic cycle of education, studies on the transition from school to work, and encouragement and utilization of educational research;

- Population and development policies, including research into population redistribution, determinants of fertility and mortality, studies of family planning programs, and some problems of urban development; and
- Science and technology policy, concerning issues such as national technology choices, the effects of technical change, the diffusion of technology, and markets for technology as they relate to both industrialization and to rural development needs.



The present director of the Division, David W. Steedman, was appointed in October 1978.

### The year in brief

During the 1978-79 fiscal year, some 40 social science research projects were approved by the Centre's Board of Governors.

A number of changes took place within the Division in 1979, including the amalgamation of several programs and the addition of new areas of responsibility. This process, which is in response to the evolving needs of developing country researchers, is expected to continue during 1980.

In the past, the Division has concentrated much of its research support in Asia and Latin America, primarily because there already exists a relatively strong demand for social science research in these regions. During 1979 more emphasis was placed on developing research projects in Africa and the Middle East. This thrust will continue in part with a series of smaller projects that



*Study of social organization in African villages helps remove constraints.*



should help to develop a stronger social science research capability in these regions.

Not that such involvement is new. In Africa, for example, IDRC helped in 1976 to establish the Council for the Development of Economic and Social Research — the first voluntary scholarly organization on that continent to serve both the anglophone and francophone countries. The Council continues to receive IDRC support on a declining scale. It now has 49 active member institutions in 25 countries and aims to identify and encourage policy-relevant social science research in Africa.

The Division's support for science and technology policy research has earned the Centre a worldwide reputation in this field. In the past year the Centre began funding a new 2-year study linking six Central American countries in a co-operative effort to increase the effectiveness with which science and technology can contribute to the region's development objectives. In the Caribbean a similar project to establish the scope and limits of science and technology in that region entered a 2-year second phase that will attempt to define the region's technological capabilities in specific sectors.

The Division's concern with the processes of modernization and change also extends to the agricultural sector. In West Africa IDRC is supporting ICRISAT (International Crops Research Institute for the Semi-Arid Tropics, based in India) in a series of agroeconomic studies. Based on earlier research in Indian villages, the African village studies will seek ways to remove constraints to development by studying such factors as cropping and labour patterns, farmers' attitudes, social organization in the villages, and access to markets. In Brazil, where the transformation of the agricultural sector has succeeded in making the country a net exporter of food, there are indications that employment in the sector may actually have declined. The Centre is now supporting a study of the impact of Brazil's agricultural development on the labour market — a study that may prove

to be a model for several other Latin American countries undergoing similarly rapid change.

Another indicator of modernization and change is fertility. In Sierra Leone, where research on population dynamics and policies is in its infancy, the Centre is supporting a 2-year study of fertility patterns in four rural chiefdoms. By providing accurate data on fertility levels and the use of and attitudes to various forms of contraception, the survey will contribute to the provision of adequate medical and family planning services in the country. Five countries are participating in a joint project, now in its second phase, to examine the cultural factors determining fertility levels and contraceptive use in the multiethnic societies of Southeast Asia. The second phase will further test the hypotheses developed in phase one and report on the policy implications of the researchers' findings.

Education is an expensive but essential element in the development process. How best to utilize the funds available for education is a question of vital concern to all developing countries. In Nigeria, IDRC is supporting a 2-year project to analyze systematically the teacher's role and to develop a low-cost, reliable method for monitoring and improving teacher performance. The research will be carried out by the West African Examinations Council, an organization of five English-speaking countries. A Latin American study will attempt to determine the impact of preschool programs on grade one performance. The project, involving four countries, should help to solve the problems caused by slow progress and repetition in the early grades, where children may require an additional 3–4 years to complete a primary education. A related project in the Philippines will test the retention of literacy and numeracy skills among primary school-leavers. The project is one of several in different countries supported by a group of donors in an international effort to find the "threshold level" of schooling.



## Learning about learning

For many developing countries the cost of bringing Western-style universal education to all their people is so high as to make the goal virtually unattainable. The result is immense waste, for all those millions of bright young persons who will never acquire even the basic skills of literacy, or who are prevented from reaching their full potential, represent an untapped human resource. There lies the dilemma — developing countries cannot afford to provide the education their people need, and they cannot afford not to.

A good deal of research has been carried out around the world in an attempt to solve educational problems, but for the most part it has been scattered and uncoordinated, and the results have often been neglected or never made available to the policymakers and others who could act upon them.

Recognizing the dimensions of this problem, IDRC decided to begin with a basic approach: to review and bring together results of research carried out in, or of special interest to, the developing countries. As a first step, the Research Review and Advisory Group was formed. It consisted of 10 independent researchers from Africa, Asia, the Caribbean, the Middle East, Europe, and North and South America. Their assignment: to review the present state of educational research as this relates to the educational problems of developing countries; to identify both the major advances and the significant gaps in research to date; and to present their findings in a manner that is useful both to researchers and policymakers in devel-



*The future of the developing countries lies in their human resources.*

oping countries and to the international funding agencies.

The task proved to be a formidable one. To reduce it to manageable proportions, the Group agreed to focus on basic education (generally primary level schooling), in recognition of the fact that primary schoolchildren are by far the largest group in the school system in developing



countries and account for the largest proportion of the education budget. Yet they often leave school without having acquired even the most essential of educational skills: literacy. The Group also initially limited its explorations to research on the organization and conduct of learning. It was still left with a mountain of material to gather and collate.

A hectic 2-year program has seen numerous achievements. No fewer than 26 large-scale studies on scholastic achievement were synthesized in a single volume, as were seven regional and national reviews on teacher effectiveness. Workshops were held both to inform and to learn from researchers, educators, and policymakers in Southeast Asia, Latin America, and West Africa. Educational information networks have been identified and strengthened in Africa, Asia, Latin America, and the Middle East, and summaries have been prepared of research findings on topics such as adult literacy, malnutrition and its effects on intellectual development, and the relationships between education, work, and employment.

From these and other activities have emerged numerous findings — some of them surprising, others confirming long-held suspicions. For example, according to many of the studies reviewed, the number of students in a class has no significant effect on learning and teachers' academic qualifications, such as university degrees, do not relate to either the teachers' performance or the pupils' achievement. Another finding was that women teachers tend to perform more effectively and to be more satisfied with their profession than do their male colleagues. Factors such as social and economic status, health, nutrition, and parents' educational level were all found to exert an influence on learning in developing countries as elsewhere — although the connection between "low" socioeconomic status and low scholastic achievement appears less marked than in developed countries.

Perhaps the Review Group's most

significant achievement — and one with the greatest implications for research in other areas of the social sciences — resulted from its early and deep concern with the "research process." This the Group defined to be all the stages in a research activity, from inception to use of results. Through detailed study of the many elements involved, the Group was able to formulate hypotheses about the development of "educational research capacity" on a national scale. Preliminary application of these hypotheses indicates that further research in this field would be useful in the development of a stronger national research community.

These are just a few examples of the Group's findings, many of which have already been published in a series of reports and summary reviews aimed at developing country researchers and government departments concerned with educational research priorities, at international funding agencies, research organizations, and the like. Reactions to these papers, together with the Group's recommendations for future action, will be contained in a final report, now in preparation, which will be published and widely distributed by IDRC in 1980.

In the final analysis, research is of little value unless it is used. To be used, it must be practical, understandable, and above all available, not only to that ill-defined figure the "policymaker," but also to other researchers, educational administrators, teachers, students, parents — in fact to the public at large. All are potential participants in, and audiences for, educational research.

If the work of the educational Research Review and Advisory Group achieves nothing more than to increase the availability of research results in developing countries and to broaden awareness of the participatory nature of the research process, then it will have made a considerable contribution. For this in itself is a major step toward helping the developing countries tap the greatest of their natural resources — the talents of their own people.

## Peopling the new frontiers

There are still frontiers in the world — areas that for one reason or another are underpopulated and underdeveloped but have great potential. Canada's North is one. Most such areas are in the developing world, usually inhospitable regions of jungle or desert, mountain or swamp.

The Sudd is one example. Africa's largest swamp, it covers some of Southern Sudan, is virtually impassable, and has been described as one of the most hostile and water-wasteful environments on earth. Or there are the dense jungle river valleys of the Brazilian interior, key to a vast region with immense resource potential, yet just as remote, hostile, and inaccessible as the swamps of Sudan.

These regions, and others like them throughout the developing world, are at last starting to be developed. Properly exploited, they could well provide the additional agricultural and other resources to turn around the economies of many developing nations. Given the right kind of development, even the desert may be made to bloom.

The one ingredient essential to the success of any frontier development project is people. Invariably such projects involve the movement of large numbers of people into the frontier area, and inevitably such large-scale development affects the lives of those people who already inhabit the region. The human element of frontier development is an extremely sensitive factor that is of particular concern to project planners and managers who know that their projects stand the greatest chance of success if their people are properly motivated. The Centre's Social Sciences Division has

supported several research studies in this field in recent years, and it is an area of increasing activity for the Division's population and development policies program.

Many developing countries are trying to open up new territories by providing incentives for people to move out from the overcrowded cities and other densely populated areas. These efforts at redistributing the population have met with various degrees of success, as shown by a 2-year comparative study begun in 1975 and funded by IDRC in five Asian countries with the aim of finding out what works, what doesn't, and why. In 1976 a similar project to study and evaluate population distribution policies in seven Latin American countries was begun, also with Centre support, and the final meeting of the participating researchers was held in Colombia in March this year. Each country studied one particular aspect of its policy and program development. Based on the experience gained, a further project has been drawn up to provide a regional policy overview of resettlement programs.

The new project will attempt to fill gaps in knowledge revealed by the earlier studies and will prepare reports on specific issues, such as land reform, resettlement, and colonization. Most important, it will provide government officials, planners, and community leaders with a broad regional perspective that should do much to smooth the path of future frontier development projects.

Brazil is one Latin American country with many such projects. The rapid influx of settlers and investments into





*Studies will reveal the likely impact of development on the local people.*

newly opened frontier areas has resulted in complex and often confusing situations, and even social conflict. Last year the government began planning the development of a new frontier area, the region around Sao Felix do Xingu, some 1100 km northwest of the capital, Brasilia. IDRC has agreed to support an independent study that will provide new perspectives on the socioeconomic impact of the project. It will be the first time researchers have been able to study the impact of such a project from its beginning. Their findings should help planners of future developments avoid many of the pitfalls of the past.

The Government of Sudan in the past 20 years has had considerable experience in encouraging the movement of populations away from the sites of the major engineering projects into new towns or agricultural development schemes. Researchers have evaluated each major resettlement project and made recommendations for the benefit of administrators and managers. Now with the aid of an IDRC grant they are attempting to find out how much effect their reports have. Are they read? Are their recom-

mendations acted upon? And if not, why not? Overwork? Disinterest? Inability to comprehend results? Lack of resources? It is a unique effort to ensure the usefulness and practicability of research, with the ultimate aim of designing an "optimum resettlement model." Such a model could have worldwide applications but would be particularly useful in Sudan's newest large-scale development project — the Sudd.

There have been plans to tame the Sudd for more than 50 years, but it was not until 1974 that the governments of Egypt and Sudan agreed upon a plan to construct a major navigable canal and a smaller parallel irrigation canal that will partially drain the Sudd and provide huge amounts of additional water to both countries. Costs for the construction of both waterways, a road that will follow the canal embankment, and the reclamation of swampland will exceed \$200 million. Sudan has allocated another \$45 million for irrigation schemes to use the water from the Sudd to open up 80 000 hectares of agricultural land.

Because all the construction will take place in Sudan, the Sudanese government was particularly concerned with the socioeconomic impact of the Jonglei Canal project. Top priority was given to a wide-ranging survey to discover the hopes and fears of the local inhabitants, the likely impact of the development on their lives, and to identify whatever services will be needed in the areas affected by the project. IDRC's contribution is small but important. At the request of the Jonglei Canal Commission, the Centre is providing assistance for the preparation and computer analysis of the survey data, and the writing and production of 11 reports based on the survey results, each dealing with a major policy-related sector. The reports, now in preparation, will be valuable to the various national and local government agencies and should ensure that the human element is not forgotten in what must rank as one of the most ambitious projects of its kind ever to be undertaken.



## Health Sciences program

About 15 percent of the Centre's project budget goes annually to the Health Sciences program. Since 1970 the Division has supported more than 160 research projects dealing with a wide range of health issues — from contraceptive vaccines to improved water pumps.

The majority of the Division's projects are concerned with the health problems of people in rural areas because these regions of the Third World have the greatest need. Doctors and hospitals are rare outside the cities. Many projects, however, are universal in their application, and there is a special concern for the plight of rural-urban migrants living in squatter settlements around major towns and cities.

The Division maintains worldwide links with other international agencies to ensure that its research results are shared. It also participates in major international research efforts such as the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases and the work of the International Committee on Contraceptive Research.

The program focuses on four main areas of research:

- Rural water supply and sanitation, with emphasis on the development of water and sanitation technologies, management and social aspects of water supplies and wastes reclamation;
- Basic health services, including studies of rural health care needs, training and personnel needs, and support for pilot health care delivery programs;
- Fertility regulation, stressing the need for better and safer contraceptive methods and studies of possible side-effects of existing methods; and

- Tropical diseases, seeking biological and environmental control of some of the major tropical diseases through research at the national and international level.



The director of the Health Sciences Division, Dr John Gill, was appointed in 1975.

### The year in brief

The Health Sciences Division received Board approval for 29 new projects during the 1978-79 fiscal year, with a total appropriation of \$4 million. More than one-third of these projects dealt with the related fields of water supply and sanitation.

A plentiful supply of clean water and a suitable method of waste disposal are essential for the health of a community.



*Improving environmental health is a primary goal of the program.*



But they will bring little improvement in health if the people are not motivated to use them. The right technology needs to be combined with effective health education programs and basic health care. Research aimed at these aspects of environmental health is highlighted elsewhere in this section of the *Review*.

Sewers are an expensive way of handling human wastes and are not practical in rural areas where most people in developing countries live. In an effort to develop inexpensive alternatives, IDRC is funding a network of research projects. In Thailand, for example, there is a 2-year study to find useful methods of waste disposal, such as composting or the reuse of waste products as fish feed. A similar project in Guatemala will study composting and biogas production systems. In Zambia a number of existing low-cost sanitation technologies for use in peri-urban areas will be evaluated.

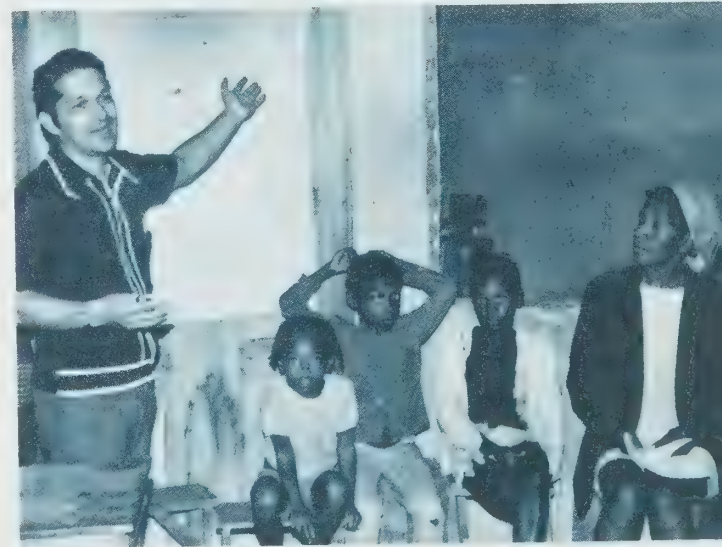
To provide rural communities with basic health care services and health education, IDRC has pioneered research in health care delivery systems in many parts of the world and continues to do so. In a new project in Indonesia, researchers are attempting to create a community health program and referral system for some 40 000 people who live in the "informal suburbs" of the big cities. In rural Bolivia a study is being made to determine the health problems facing three different geographic and linguistic rural areas, the existing resources for solving them, and the use now being made of these services. The information will help in planning improved services.

Water management and control of industrial wastes are equally important to a healthy environment. In Sudan the Centre is supporting a study of the social and economic aspects of water supply, which is being carried out by the University of Khartoum in four diverse areas of the country. As a first step toward improving rural water supply, the study will ascertain who controls the water and how. In Malaysia, where the rapid growth

of palm oil production has resulted in widespread pollution from oil mills, the Centre is supporting a year-long study aimed at developing affordable treatment processes and controls.

In the field of tropical diseases the Health Sciences Division continues its support for the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases, which is concerned with eradicating the six major tropical diseases that affect millions of people in the developing world — malaria, schistosomiasis, leprosy, filariasis, trypanosomiasis, and leishmaniasis. In 1975 IDRC helped to bring together the task force that led to the establishment of the Special Programme. The Centre also seconded a senior staff member to help start the field research and has remained one of the Programme's strongest supporters during its early stages of development.

The Programme is now fully operational and is supporting an extensive series of research and training activities in numerous institutions in the developed and the developing nations. The future of the Programme is now secure for at least 5 years, and as a result this is likely to be the last year of IDRC funding. The Centre also continues to support a number of research projects concerned with diseases that are not presently covered by the Special Programme. These in-



*Effective health education programs motivate people to help themselves.*

clude a study in Indonesia of the increasingly prevalent dengue hemorrhagic fever and research in Guatemala on intestinal infections and related diseases that are often fatal in young children.

In the field of contraceptive research the Division supports a number of projects concerned with possible effects on health of contraceptive use. It also continues its support for the work of the ICCR (International Committee on Contraceptive Research). This consortium

of top scientists from both the developed and the developing countries is jointly funded by a group of international donors, and during 1979 IDRC approved a grant for an additional 3 years of support. The Committee has already produced a number of promising new contraceptive technologies that are now being carefully tested. If all goes as expected, several of these new contraceptives could be available at reasonable cost within the next 2–3 years.

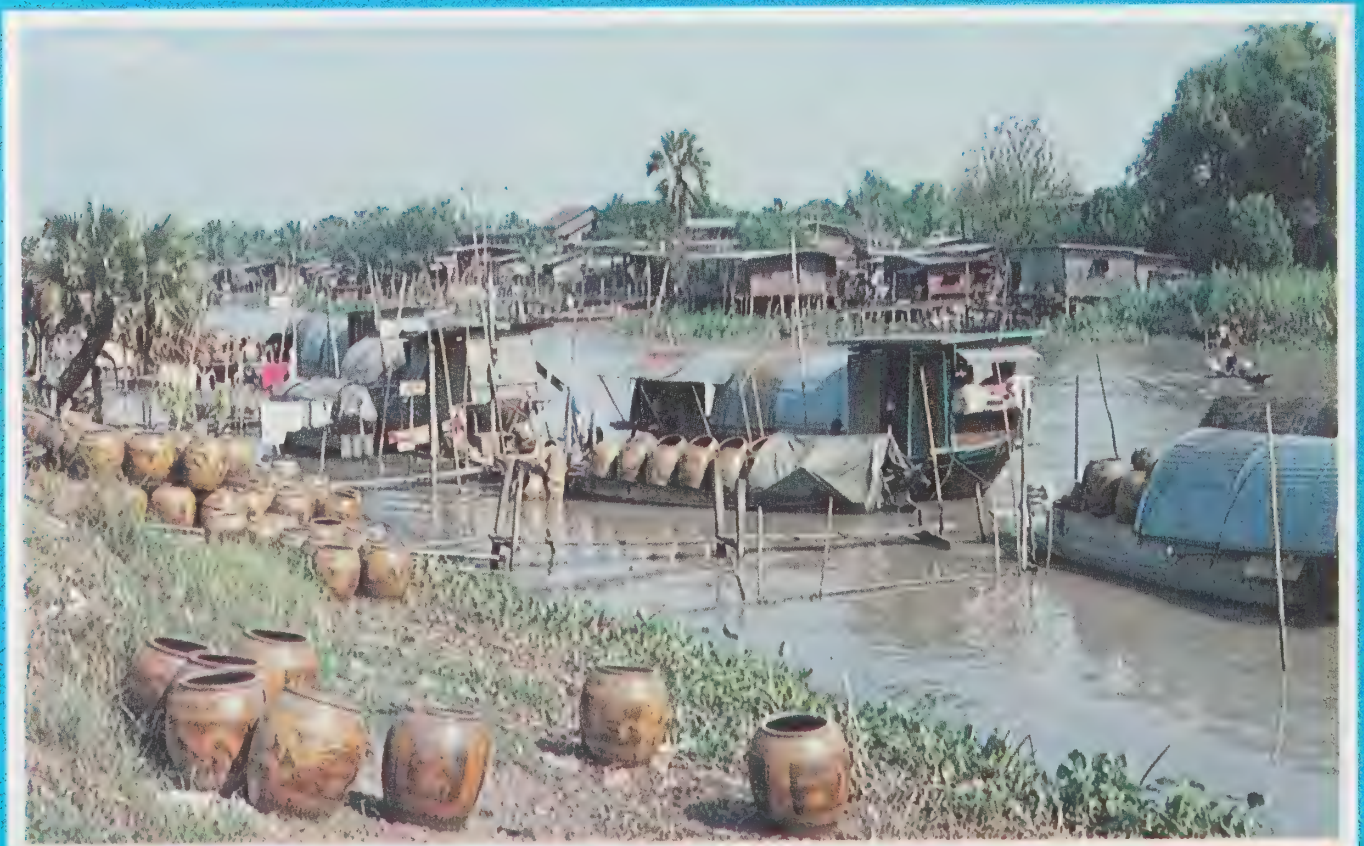


*Researchers in Guatemala question villagers on the children's health.*





*Children in Ethiopia sample clean water from a prototype pump.*



*Canal outside Bangkok: attractive to tourists, but dangerous to drink.*



## Toward a healthier environment

The city of Bangkok is laced with a network of large and small canals called *khlongs*. The *khlongs* provide an alternative to the city's overcrowded streets for transporting goods and people; they provide an attractive view of the city for tourists who stop and shop at the floating markets; and they are home for Bangkok's own boat people. They are also seriously polluted and a hazard to health.

Bangkok, with an estimated 4.5 million inhabitants, has no sewer system. Much of the effluent from cesspools and septic tanks and the few sewers that exist finds its way eventually into the *khlongs*, and thence into the Chao Phya River, turning it into virtually an open sewer and making its waters dangerous for drinking or even washing.

The problem Bangkok faces is by no means unique, nor is it peculiar to large cities. But it does demonstrate dramatically one of the most urgent, and least publicized, problems facing many developing countries today — the need for effective sanitation systems and clean water supply. We will likely be hearing a lot more on the subject in the next few years, as the 1980s have been declared by the UN as the International Water Supply and Sanitation Decade.

This dual problem has been a major focus for IDRC's Health Sciences Division for the past several years. On the water supply side, the Centre funded the development of a prototype plastic pump for use primarily in rural areas of developing countries. Designed at Waterloo University in Ontario, Canada, this pump is made of plastic because it is cheap, durable, and easy to manufacture locally

in Africa and Asia. Various versions of the pump are now being thoroughly field-tested in villages. This enables the designers to cope with such unforeseen problems as goats chewing on the spouts and small children dropping pebbles into the outlet pipe. The end result will be a water pump designed specifically for manufacture and use in developing countries. But it will only be part of the solution.

Most water supply projects in developing countries operate on the assumption that improved health will follow automatically once water is readily available. Recent studies indicate that there is no evidence to support this theory so long as the supply of water is seen as an end in itself. Many gastrointestinal and skin diseases are water-related; thus there is unlikely to be any significant improvement in health unless sanitation facilities, basic hygiene, and water use practices are also improved. In fact most villagers in developing countries simply defecate in the fields or bushes around their home, with a disastrous effect on the health environment.

The next step up the "sanitation ladder" is the pit latrine, but, unless properly built and maintained, this too may invite disease. If the pit is too deep, it may pollute the groundwater. Sewers are simply too expensive an option to be even considered. Between these two extremes there exist numerous other sanitation techniques, and many of these are now being studied and adapted in Centre-supported projects in Africa, Asia, and Latin America.

In Tanzania, where the government



plans to implement a nationwide program for latrine building, the Centre is supporting the second phase of village-level testing of a composting toilet that not only improves sanitation but supplies a humus that can be used as fertilizer. In neighbouring Zambia, Mozambique, and Botswana projects are under way to improve sanitation in the mushrooming squatter settlements around the major cities.

Thailand's problems in this field are not limited to the *khlongs* of Bangkok. Disposal of wastes in rural areas presents many of the same problems here as in Africa. In cooperation with the Bangkok-based Asian Institute of Technology, the Centre is supporting studies of selected methods of waste disposal. These include composting and the use of biogas digesters, as well as the potential reuse of wastes as fish feed in aquaculture programs. On the other side of the Pacific, in Guatemala, researchers are studying and adapting similar technologies with the aim of developing low-cost sanitation to improve health in isolated Indian communities. One particular advantage of this project is that it will test the working of the compost toilet and the biogas plant at altitudes up to 2500 metres.



*One of several low-cost latrines being tested in a Tanzanian village.*

In spite of their cultural and geographic differences, these projects and many others supported by the Centre's program have a number of things in common. Not least among these is the fact that, in addition to improving the health environment, each is designed to turn unpleasant, unhygienic wastes into useful by-products.

The Centre is also supporting research in several countries aimed at gaining a better understanding of all the factors involved in the complex relationships between water supply and sanitation. In the Indian state of Uttar Pradesh a large-scale rural water supply program is under way. One group of villages will receive an improved water supply. Another will receive water supply and a sanitary education program, and a third will receive both these inputs plus government help to construct an elementary drainage system. A fourth group of villages using traditional water sources will serve as a control. A related project in neighbouring Bangladesh will study similar combinations using hand pumps, latrines, and sanitary education programs.

The two projects should do much to resolve the debate on the impact of water supply and sanitation improvements. In addition, the research will improve and standardize practical methods for diagnosing water-related diseases and measuring the quality of the health environment.

Finally, again to Bangkok, where environmental health is a major concern, particularly in the estimated 250 "marginal settlements" — slums. The majority of the slum dwellers are squatters who have nowhere else to live. Most are willing to improve their communities, but they need help, and to give it to them, the city needs more information on just what combination of improvements will be most effective. IDRC is supporting a study of environmental, physical, and socioeconomic conditions in 20 slum communities that could provide a blueprint for upgrading squatter settlements in cities around the world.

The Centre has always placed great importance on the publication and dissemination of results of IDRC-supported research. The Communications Division produces a wide range of technical and scientific materials for worldwide distribution, particularly in the Third World, in addition to general publications and films to inform the public about the work of the Centre.

The following is a list of recent productions. Complete catalogues of current IDRC publications in English, French, and Spanish, and of available audiovisual productions, can be obtained from: Distribution Unit, Communications Division, IDRC, Box 8500, Ottawa, Canada K1G 3H9.

## Publications

*IDRC Annual Report 1978-1979. Rapport annuel CRDI 1978-1979.* Ottawa, Ont., IDRC, 1979. 61 p. IDRC-003/79e,f.

*Le Projet IMPACT: rapport intérimaire sur les projets IMPACT (Philippines) et PAMONG (Indonésie) organisés par l'INNOTECH.* Clyde Sanger. Ottawa, Ont., CRDI, 1979. 56 p. IDRC-088f. (Also available in English IDRC-088e)

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*Caqueza: living rural development.* Hubert Zandstra, Kenneth Swanberg, Carlos Zulberti, and Barry Nestel. Ottawa, Ont., IDRC, 1979. 321 p. IDRC-107e. (Also available in Spanish IDRC-107s)

*Coffee pulp: composition, technology,*

*and utilization.* J.E. Braham and R. Bressani, editors. Ottawa, Ont., IDRC, 1979. 95 p. IDRC-108e. (Also available in Spanish IDRC-108s)

*Science et technologie pour le développement: rapport comparatif principal du projet «Instruments de politique scientifique et technique», STPI 2.* Francisco Sagasti. Ottawa, Ont., CRDI, 1979. 124 p. IDRC-109f. (Also available in English IDRC-109e and Spanish IDRC-109s)

*Searching: report on the activities of IDRC 1978.* Ottawa, Ont., IDRC, 1979. 32 p. IDRC-110e. (Also available in French IDRC-110f and Spanish IDRC-110s)

*Cultural action and social change: the case of Jamaica. An essay in Caribbean cultural identity.* Rex M. Nettleford. Ottawa, Ont., IDRC, 1979. 239 p. IDRC-111e.

*Beyond Manila: Philippine rural problems in perspective.* Gelia T. Castillo. Ottawa, Ont., IDRC, 1979. 420 p. IDRC-116e.

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*Earthquake history of Ethiopia and the Horn of Africa.* Pierre Gouin. Ottawa, Ont., IDRC, 1979. 259 p. IDRC-118e.

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*Mujer rural y desarrollo: nuevo enfoque de la educación del hogar en América Latina.* Eleonora Cebotarev. Bogotá, CIID, 1979. 188 p. IDRC-121s.

*Projects 1970-1978.* Rowan Shirkie, compiler. Ottawa, Ont., IDRC, 1979. 92 p. IDRC-122e. (Also available in French IDRC-122f and Spanish IDRC-122s)

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*SALUS: low-cost rural health care and health manpower training, volume 5.* Rosanna M. Bechtel, editor. Ottawa, Ont., IDRC, 1980. 194 p. IDRC-144e.

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*Un système interactif sur mini-ordinateur pour la recherche documentaire et la gestion de bibliothèques.* Faye A. Daneliuk. Ottawa, Ont., CRDI, 1979. 19 p. IDRC-TS14f. (Also available in English IDRC-TS14e)

*Rural health care in Egypt.* Nawal El Messiri Nadim. Ottawa, Ont., IDRC, 1980. 40 p. IDRC-TS15e.

*The theory and practice of induced breeding in fish.* Brian J. Harvey and William S. Hoar. Ottawa, Ont., IDRC, 1979. 48 p. IDRC-TS21e.

*IDRC library bulletin/Bulletin de la bibliothèque du CRDI.* Ottawa, Ont., IDRC/CRDI.

*The IDRC Reports/Le CRDI Explore/El CIID Informa* (Michelle Hibler, Editor-in-Chief). Published in three separate language editions, this is a quarterly magazine about the work supported by the International Development Research Centre and about related activities in the field of international development and is available on request from the Centre's Communications Division.

*IDRC Features/Reportage CRDI.* This monthly news features service on scientific, technical, and educational subjects pertinent to development is provided free of charge to selected newspapers and magazines in the developing world.

## Films

*Oyster farming in the tropics.* This film, mainly intended for instructional purposes, examines the methods and the problems involved in "farming" oysters. It includes scenes of oyster culture projects in Sabah, Malaysia, and Sierra Leone, and describes well-established systems in Japan and the Philippines. (28 minutes)

*Pods of protein.* This film documents the work being done to improve cowpeas, an important food legume that accounts for a large proportion of human protein intake in some regions of the Third World. The film demonstrates that any attempt to improve this traditional crop must take into account local tastes and food processing methods. (23 minutes)

*An end to pounding.* Traditional processing of sorghum — pounding with a mortar and pestle — is laborious and inefficient. This short, educational film tells the story of how a novel machine for removing sorghum hulls may bring a wide range of benefits to both producers and consumers in Botswana. (15 minutes)



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# Searching

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## Review of IDRC Activities 1980...



and a look  
back at IDRC's  
first decade  
1970-1980



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# Searching

Review of  
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first decade  
1970–1980

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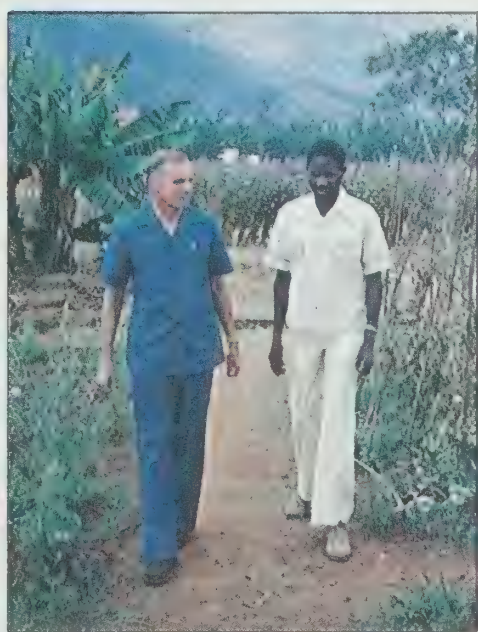






This report marks the tenth anniversary of the founding of IDRC. The Centre came into being on the eve of the United Nations Second Development Decade. The commencement of that decade was heralded, and its record chronicled, by two World Bank commissions. The earlier commission, chaired by the late Lester B. Pearson, termed international development "a great challenge of our age." The later commission, chaired by Willy Brandt, speaks of the present "crisis" and the need to "avert catastrophe."

The contrast of environments—1970 and 1980—cannot be more dramatically described than in the titles of these two reports. Pearson: "Partners in Development"; Brandt: "North-South, A Program for Survival."



IDRC President Ivan L. Head visiting cropping systems project in East Africa.

The message of Pearson was one of confidence that change would ensue; the recommendations focused primarily on a larger transfer of resources. The message of Brandt is far from confident: worldwide catastrophe threatens; the recommendations call for major structural reforms in the international community.

Development can be regarded no longer simply as a challenge; it is the dominant factor in contemporary world events. The economic future of the industrialized countries depends now—as it did in 1870 and in 1929—upon growing overseas markets, largely in the developing countries. The equilibrium of the biosphere is faced now—as it has never been faced before—with irreversible destruction as deforestation and pollution relentlessly spread. The survival of mankind is threatened—more credibly than at any time in history—by nuclear arsenals and by conventional armament stockpiles in the possession of regimes ravaged by political instability.

Pearson argued that in the simplest of terms development was an imperative because "it is only right for those who have to share with those who have not."

Brandt added a critical argument: "To diminish the distance between 'rich' and 'poor' nations, to do away with discrimination, to approach equality of opportunities step by step, is not only a matter of striving for justice, which in itself would be important. It is also sound self-interest, not only for the poor and very poor nations but for the better-off as well."

Self-interest. Economic self-interest. Ecological self-interest. Political self-interest. The moral imperative of survival.



The Pearson Commission Report was in many respects a seminal inspiration for IDRC policies. Mr Pearson became the first Chairman of the Board of Governors. One of his distinguished commission colleagues, Roberto Campos of Brazil, joined him on the first Board. The Pearson Report found that research within developing countries was practically nonexistent and that as a result scientific and technological achievements remained the sole prerogative of the industrialized countries.

Maurice Strong, who was both the inspiration and the chief architect of the Centre, argued persuasively that research had not been an element in developmental assistance programs because of its long-term nature and the inherent risks contained in research undertakings. The creation of IDRC by the Parliament of Canada was intended to overcome those problems by providing both independence and some certainty of funding.

In this quest, stamina is a major requirement. Research activity, especially in the biological sciences, often requires lengthy involvement before results are achieved. The enhancement of human and institutional capacity is a time-consuming process even in the most technologically advanced societies. In those countries that are painstakingly crossing the threshold from bronze-age to space-age, accomplishment cannot be expected in regular annual increments.

In 1980, the *raison d'être* of the International Development Research Centre remains as pressing, and the demand for its activities as high, as at the time of its birth. Research, whether described as "developmental" in nature, or "pre-investment," continues to be regarded increasingly by both North and South as an absolutely essential element in the economic and social processes.

The International Development Research Centre is an institution quite unlike any other. Both in terms of its role as a Canadian quasi-governmental organization, and in the international context, it has never quite conformed to any of the standard definitions.

The Centre is, in the words of its first chairman, the late Lester B. Pearson, "something that is unique in international organizations." This uniqueness is no accident, the Centre was designed to be different.

Recognizing the sensitivity and the essentially high-risk nature of development research, the architects of the IDRC Act created a remarkably flexible organization—a government-funded public corpor-

best carried out by scientists of the developing world. Ten years ago it was a fairly revolutionary approach. Even today it is still unusual.

At their first meeting in October 1970, the Board of Governors agreed that the primary "target group" of IDRC-supported research should be the rural poor, especially in the semi-arid tropics, where the rural people are at greatest risk, and in greatest need. Throughout the Centre's first decade these two guidelines have remained constant.

The Centre's project grants are administered by four program divisions: Agriculture, Food and Nutrition Sciences, Health Sciences, Information Sciences, and Social Sciences. The work of these divi-



**The Board of Governors meeting in October 1980: ten years of service.**

ation that has no parallel in Canada. What distinguishes it most is its Board of Governors. Composed of 11 Canadians and 10 members from other countries (six of whom are usually from developing countries), this Board approves all major projects and sets the Centre's policy directions.

At the international level what distinguishes the Centre from other government or non-government development agencies is its approach. Since its inception the Centre has operated on the assumption that the best people to decide what the developing countries really need are the people of those countries, and that research aimed at meeting those needs is

described in more detail in the next chapter of this Review.

Over the years there have been some changes in the structure and responsibilities of the program divisions, but the basic structure has remained unchanged during the Centre's first decade. During 1980 the first steps were taken to establish a new program.

This move is part of the Centre's response to a commitment made by the Canadian delegation to the United Nations Conference on Science and Technology for Development in Vienna in 1979. Canada promised funds for a program to enable the developing nations to share in Canadian



research and development expertise. IDRC was asked to undertake this new program by the Canadian government, an invitation accepted by the Board of Governors "on the clear understanding that the independence of the Centre not be weakened."

Canada's pledge at UNCSTD was made in response to a proposal by developing countries that a portion of the domestic research and development capacity of developed countries be applied to the solution of developing country problems, such application to be undertaken as far as possible through cooperative arrangements. Funds for this program of collaborative research will be separate from the Centre's regular budget, and will begin to flow in April 1981.

After careful review within the Centre it was decided that part of the funds would be reserved for collaborative research within the areas of concentration of IDRC's four established program divisions; the rest of the funds would be used to support cooperative research programs in fields where Canada's research and development capacity matches developing country requirements.

As this program grows, and gives the Centre a new set of development responsibilities, there will be no deviation from the principle of responsiveness to the needs of developing countries as defined by them. Every effort will also be made to ensure that the structure of cooperative relationships between the research com-



The rural poor are the primary "target group" of IDRC-supported research projects; they are at the greatest risk.

In preparation for this activity, a Cooperative Programs Unit was established as part of the President's Office in August 1980, and a series of consultations was opened with Canada's research community. The fact that planning for the new program had begun was also made known to developing country institutions. Response from both quarters was encouragingly positive. Canadian researchers welcomed the opportunity to link their expertise with the needs of developing countries in research partnerships. Developing country institutions saw in the proposed new program an opportunity to give the North-South relationship a tangible new dimension.

munities of Canada and developing countries will strengthen the capabilities of the latter.

The need to build a stronger scientific research capability in the developing countries underlies all of the Centre's activities. Indigenous research competence is gained by engaging in research. In addition, most Centre-funded projects include provision for both formal and field training, particularly for the younger researchers, with a view to providing a core group capable of carrying on the work once the initial project is completed.

Beyond this it was felt there was a need to provide funding for promising individual



researchers, even though they might not be directly associated with any Centre-supported project. To meet this need the Human Resources Program was established. Recently re-named the Fellowships Program, it has accounted for almost \$14 million during the past 10 years, providing opportunities for scientists at all levels to acquire or upgrade their skills in the broad field of international development. In addition the Centre contributes to a number of internationally funded scholarship programs, such as SEAPRAP—the Southeast Asia Population Research Awards Program.

This same open approach is carried through at the administrative level too, where the basic philosophy is that the purpose of an administrative infrastructure

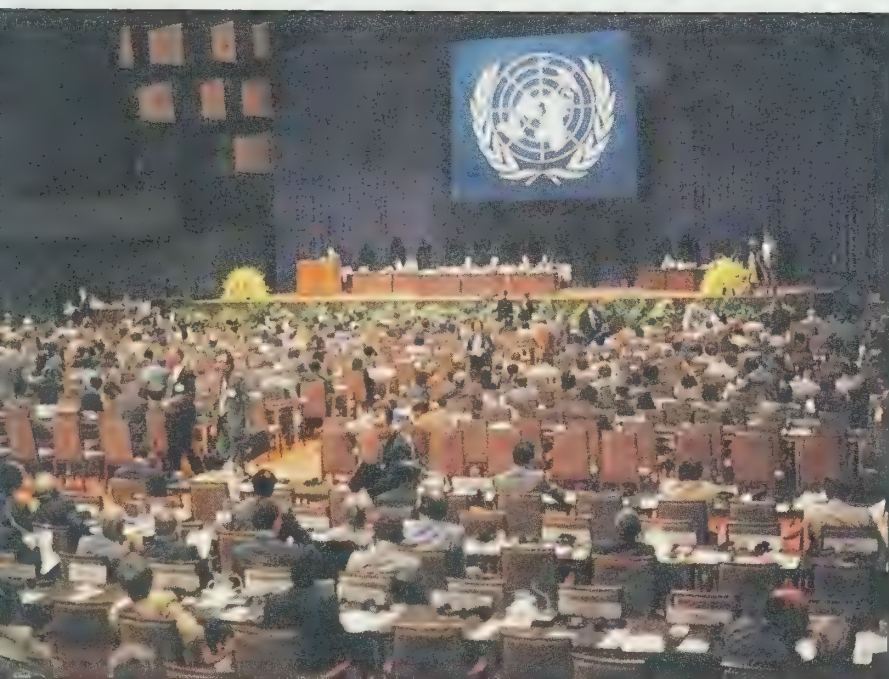
provides answers to many of the questions raised, and is now in wide use.

Although the Centre's headquarters are in Ottawa, and all its programs operate from there, it was recognized very early that, to paraphrase one of the program directors: a desk in Ottawa is not the ideal place from which to develop an effective program of research intended to benefit the least fortunate people of the Third World. For this reason the Centre established regional offices, both to provide a working base for some of its program staff and to ensure that the Centre remains in close touch with those areas of the world it is attempting to serve.

By 1973 there were regional offices in Singapore, serving the Asian region; in Bogota, serving Latin America and the Caribbean; and in Dakar, serving West Africa. The following year a regional office for the Middle East and North Africa was opened in Beirut—shortly before the outbreak of hostilities there. The office was subsequently re-established in Cairo. In 1976 a fifth regional office was established in Nairobi, serving East and Central Africa. This office was temporarily closed in 1978 as a result of a government freeze on the Centre's annual grant, but was re-opened in October 1980.

Most of the directors of the regional offices have been drawn from the region served by each office, and many of the professional staff are also recruited from the regions. In recent years the regional offices have been given increasing responsibilities, and in some cases a degree of autonomy that allows considerable freedom of action in many administrative and financial areas. Regional Directors are also members of the Centre's Management Group.

This decentralized structure not only enables the Centre to have a closer working relationship with the governments, scientists, and research institutions of the Third World, it also ensures that the needs and aspirations of the regions are always a factor in the decision-making process.



**UNCSTD: demanding a fair share of research and development.**

is to support the research activity—not to police it. Subject to the basic premises of accountability, every effort is made to keep the administration of project funds as flexible as possible, always keeping in mind the difficulties facing many struggling research institutions in developing countries.

An example of this responsive style of administration was a workshop hosted by the Centre's Asian regional office in 1979. Finance officers, coordinators, and administrators from institutions receiving IDRC grants were invited to spend two days discussing project funding and airing their problems. The outcome was a booklet on project budgeting and administration that



The Centre's four program divisions have been responsible for a total of 1019 projects with grants amounting to \$180 million since the first projects were approved by the Governors in 1970.

The text that follows gives a brief account of the activities of each division during 1980 in the perspective of the Centre's first 10 years.





## Agriculture, Food and Nutrition Sciences

Since its beginning the AFNS program has concentrated much of its resources on research to improve the traditional crops of the developing countries, crops that until then had been virtually ignored by agricultural scientists. One such crop is sorghum, the single most important cereal of the semi-arid tropics.

Back in 1972, the division began supporting sorghum improvement projects in Senegal, in West Africa, and Ethiopia, in the East, aimed at not only developing better varieties of sorghum, but at developing a cadre of African research scientists to carry on the work. Both projects are now in their third and final phase, to develop

agronomic packages that give stable yields with the new varieties under farm conditions. Perhaps most important, this phase of the work will be carried out solely by African researchers, many of whom received their training in the earlier stages of the projects.

By contrast, triticale is a new grain. One of the first successful intergeneric hybrids ever produced, it was developed by scientists in Mexico and Canada, and has been receiving IDRC support since the Centre's inception. A cross between wheat and rye, triticale is a nutritious grain that can resist drought, poor soil, high altitudes, and low temperatures. The Centre continues to support research to adapt triticale to different developing regions.



Triticale: a successful cross between wheat and rye.



Sorghum breeding in Ethiopia develops new varieties.

Barley is another traditional crop that has received inadequate attention from agricultural scientists. In Turkey, where barley is the second most important crop, Turkish researchers are working with cereal scientists at international agricultural research centres in Mexico and Syria to improve both the quality and quantity of barley. It is expected the results will be applicable in other Near Eastern countries where barley is common.

The Andean region of Latin America is the home of many traditional crops, perhaps the best known and most widely



traveled of which is the potato. There are others, however, many of which are virtually unknown outside the region. In Peru, a Centre grant has brought together three separate university research projects to study traditional crops in a major effort to raise the standard of living of the small-scale farmers of the high Andes through improved farming systems.

Another root crop thought to have originated in this region is cassava—also known as manioc or tapioca—which is now a staple in many developing countries. As part of its continuing support for cassava research, the division approved a project to collect wild, previously uncultivated, species in northeastern Brazil and screen them for economic and other desirable

characteristics. Such projects not only improve crops, they increase the plant genetic pool available for future breeding programs.

One of the division's most successful programs to date has been the cropping systems network it helped to establish and support in Asia. Multiple cropping, scientifically practiced, can greatly increase the food production potential of a given piece of land and make more effective use of labour and other resources. Multiple cropping is familiar to many smallholder farmers in Latin America, and the division is now using its Asian experience to help establish a research network that will seek to adapt the lessons learned in Asia to multiple-cropping projects in Colombia,



Quinoa is one of the traditional crops of the High Andes.



Multiple cropping in the Philippines increases production.



An experimental plantain crop in Cameroon, West Africa.

Costa Rica, and Honduras.

Bananas and their relatives the plantains are important local food as well as major export crops in Latin America, Southeast Asia, and the Caribbean, but little research has been undertaken for the benefit of the small producers. In Panama a Centre grant is supporting research to grow legumes in banana plantations—legumes that have the ability to extract nitrogen from the air and convert it to a form that can be used by plants. A successful banana-legume combination may reduce the amount of supplementary nitrogen fertilizer required



by as much as 50 percent, restrict weeds, and reduce the damage caused to soils by erosion during tropical storms.

In the more arid regions of the world, such as Sahelian Africa, trees themselves can do much to prevent soil erosion and improve the immediate environment, as well as provide fuel, building materials, and fodder. Gum arabic from the acacia tree has a wide variety of uses, from confectionery to cosmetics.

Almost as versatile is the shea-butter tree, also indigenous to much of the Sahelian region. The shea-butter nut produces not only a high-quality cooking fat (it is one of the few naturally occurring oils that is solid at room temperature) but also many pharmaceutical and cosmetic prepa-

rations, and is even smeared on the mud walls of houses to prevent erosion. In Mali where the 1977 harvest was a quarter million tonnes of nuts, the division is supporting a project to develop simple mechanical extraction methods such as a screw press that would extract 85 percent of the oil instead of the 35 percent recovered by traditional means. The process would also leave a high-protein residue suitable for cattle feed. In 1977 the extra oil alone would have provided additional revenues of some \$30 million to the rural people of one of the poorest countries in the world.

Another product of the African forest is charcoal, which is an important source of fuel in the developing countries. But, in common with other fuels, charcoal is be-



Extracting oil from shea-butter nuts is a tedious and inefficient process.



Bamboo serves dozens of different uses in many parts of the world.

coming increasingly expensive—a fact which has focused research attention on the inefficiency of most charcoal stoves. In Tanzania the division is supporting a comparative study of numerous African and Asian charcoal burning stoves with the aim of developing a simple, fuel-efficient stove that can be built locally or adapted to available materials in other regions.

Perhaps one of the most versatile of woods is in fact not truly a wood at all: bamboo is used for everything from house construction to handicrafts to a tasty food, and although it may grow as tall and as thick as a tree, it is in fact a grass. In spite of its economic importance to many Asian countries, relatively little research has been done on bamboo, so even the means of propagation are not fully understood. In Bangladesh it is one of the most important forest products and as demand continues to



increase there is a need for large-scale plantations. The Bangladesh Forest Research Institute, with the aid of an IDRC grant, has undertaken a project to develop high-yielding, high-quality bamboo species for both household and industrial uses.

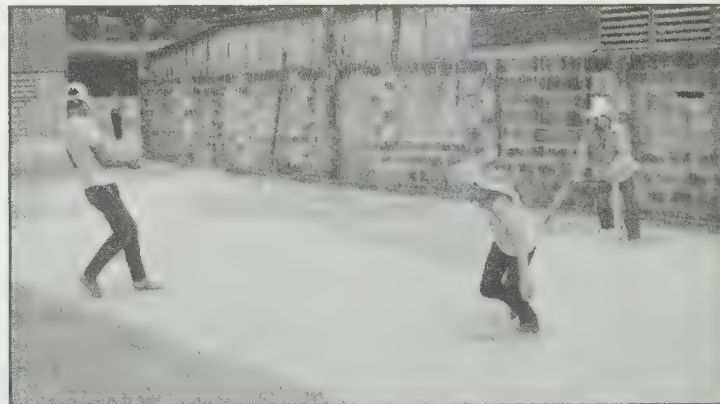
Bamboo is by no means exclusive to Asia, and neither is its close relative rice. In Sierra Leone, for example, rice is grown by 90 percent of the farmers, and in villages it is often stored on bamboo slats high above the cooking fire, where it stays dry and the smoke keeps the insects away. The country is presently making a major effort to become self-sufficient in rice, but much of this effort may be lost unless storage techniques can be improved. The division has supported numerous rice-

storage projects in Asia, and is now able to bring that experience to bear on the somewhat different African situation. By studying traditional storage techniques the Sierra Leone Rice Research Station hopes to devise improved storage that will significantly reduce the present high loss rate and be able to accommodate the projected increase in production. The project is linked to a similar study of cowpea storage in Sierra Leone, and the results should be applicable to other African countries in the same climatic zone.

In Malaysia, where fast-growing rice varieties have made two or even three crops a year possible, another kind of storage problem is presented by the rice that must be harvested in the wet season: if



Fast-growing rice varieties developed at the International Rice Research Institute can increase production.



Sun-drying rice: it only works in the dry season.

it is not cleaned and dried within 24 hours it begins to ferment. What is needed is an inexpensive, simple cleaner-dryer for the small farmer. With IDRC support, the Malaysian Agricultural Research and Development Institute is developing systems using simple equipment such as iron pots heated on a fire of rice straw. The project is part of a network of rice postharvest research supported by IDRC in Asia.

In Mali the climate is dry and the main cereal crop is millet, but the problem is the same: the inability of smallholder farmers to process the grain quickly and efficiently after harvest causes excessive losses. With IDRC support the Division du machinisme agricole is developing an inexpensive manual thresher in collaboration with a national farm machinery manufacturer. Villagers will be trained to operate it, and local blacksmiths to repair it. A successful prototype may well go into large-scale production in Mali and other millet-growing countries.



Fish is another important source of protein in many developing countries—in Mali for example fish and millet are the staples of the average family's diet—and its preservation presents a different set of problems. The division supports several research projects in fish processing, including one in Mali and another in Indonesia. Both are concerned with the uses of salt and solar energy to preserve fish. As with other "crops," the overall objectives of both projects are to develop economical techniques to reduce losses and improve quality.

But before the fish can be processed it must first be caught—or raised. Aquaculture, the practice of fish farming, has been a major research-support area for the division's fisheries program since 1972. In-

creasing interest is being shown in cageculture, in which the fish are kept in pens until they are of marketable size. The system has obvious advantages where large bodies of water are available, whether natural, like Africa's Lake Togo, or man-made like Sri Lanka's ancient irrigation reservoirs, both of which are locations for Centre-supported cageculture projects.

Many fish that have never been cultivated show great economic potential. One such fish is an intriguing Latin American species found from Mexico to Peru, and known locally as *chamé*. The fish has a unique ability to survive out of water for several days, thus offering a simple solution to the problem of transporting fresh fish. It also has few bones, tasty white flesh, and



Floating fish cages in the Philippines even have accommodation for fish farmers.



Tiny fish fry will grow quickly under the right conditions.

can live in fresh or brackish water. The question is whether it will live, and breed, in captivity, which is what an IDRC-supported project at the Fundacion Ciencia in Ecuador hopes to establish over the next three years.

One of the problems with aquaculture is the ever-present risk of disease or parasites, especially in ponds stocked at high density. The division has in recent years



encouraged greater research into the control of fish diseases, and during the past year provided support for new projects in Malaysia and the Philippines to study problems created by fish parasites in aquaculture systems.

In Latin America, however, livestock is still the main source of animal protein. Scientists in Belize have been studying common pasture legumes from the region in a project designed to obtain increased forage from marginal lands. The legumes, many of which are regarded as weeds, will often grow where no other crop can survive, and the most promising varieties will be extensively tested in the project's second phase. And in Peru a promising new project will experiment with grazing-

based animal production in the fertile but fragile ecology of the vast Amazon river basin—a project that could have considerable significance for the six countries through which the basin extends.

A number of projects are also concerned with converting agricultural by-products to animal feeds. One of the most recent to receive an IDRC grant is in Thailand, but could have wide application elsewhere. The aim of the research is to identify certain types of fungi that will act on wood and other by-products, such as sugarcane bagasse and rice straw, in a fermentation process that will increase protein content and improve digestibility. The project forms part of a worldwide network of by-products research supported by the division.



These Mexican cattle thrive on a feed based on the waste from sugarcane plantations.

## Health Sciences

Tropical diseases affect tens of millions of people in the developing countries, causing incalculable suffering and severely limiting the capacity of the people to improve their lot. Six major tropical diseases are now the subject of a concerted international research effort coordinated by the World Health Organization of the United Nations. IDRC was one of the original supporters of the WHO's Special Programme, but it is also concerned with diseases that are not presently part of that effort.

One of these is dengue hemorrhagic fever, a virus that kills from 4 to 40 percent of its victims, and is now widespread in Southeast Asia. In Indonesia, for example,

the number of reported cases has been increasing for several years to the point where the disease is now considered endemic. IDRC supported a regional seminar on the disease in 1977, and a year later provided a grant for a project to study the disease in Indonesia. Complementing that work, a further project was approved this year to study the disease in the area of Ujung Pandang, one of the few urban centres in Indonesia still reportedly free of the hemorrhagic form of dengue fever. If researchers can find an explanation for Ujung Pandang's apparent immunity, they will add considerably to understanding the nature of the disease and possible measures to control it.

Yellow fever, like dengue fever, is caused by an arbovirus. Animals of the forest act as reservoirs for such viruses, which are transmitted by insects and have been isolated not just in the tropics but in almost every area of the world other than the polar regions. At the Caribbean Epidemiology Centre in Trinidad, IDRC is supporting a project to develop simple diagnostic tools for arboviruses in general, and, in particular, to study specific methods of transmission of yellow fever by mosquitoes, and how the yellow fever arbovirus survives in the forest between epidemics.

Tuberculosis is still a major public health problem in several African countries, including Kenya. To evaluate and improve the national tuberculosis control program, the Kenya Tuberculosis Investigation Centre is carrying out a prevalence survey with the aid of an IDRC grant because no accurate statistics are available on the current tuberculosis situation in the country. Data from this two-year project will serve as a basis for future planning of tuberculosis control in Kenya.

Trypanosomiasis, better known as sleeping sickness, is a threat to some 35 million people in Africa, and a major impediment to the development of beef and dairy cattle production. As an adjunct to the WHO Special Programme, which focuses on the epidemiology and pathology of sleeping sickness, IDRC is supporting a project in Kenya aimed at biological control of the carrier of the disease—the tsetse fly. Under



**IDRC supports an international research program to eradicate the major killer diseases of the tropics.**





Inoculating cattle in Kenya: the tsetse fly is a major threat to both humans and animals in Africa.



controlled conditions, researchers will study the biology of the velvet ant and the bee fly—two of the tsetse's natural enemies—with a view to developing mass-breeding techniques of the predators as a means of tsetse control.

Many diseases could be prevented through the provision of a clean water supply and adequate toilet facilities. The division continues to support several projects under its rural water supply and sanitation program, a number of which have now moved into a second phase of research. In Botswana, in one of a network of low-cost sanitation projects for Africa, researchers built and tested numerous simple toilets for testing in squatter communities around large urban areas. Three

designs have proved technically satisfactory, but so far have not generally been well accepted in the communities. Acceptance is crucial, as the government plans to install 20 000 low-cost sanitation units in the 1980s. So in a second phase, a user survey will be conducted and further modifications and improvements made to the selected toilets. A public education program will be based on the results of the survey and economic studies will also be carried out.

In Panama, engineers have been studying simple water filtration systems that can be used to bring cleaner river water to the villages and have produced a design and construction manual for the use of sand filtration galleries. Based on these studies, improved infiltration galleries will be con-



A clean water supply in the village helps prevent disease.



Testing simple toilets to improve hygiene in Botswana settlements.



Well-nourished Colombian children can better resist diseases.

structed at four sites with different conditions and their effectiveness in providing clean water will be evaluated over several months. By putting theory into practice, the researchers will be able to revise their manual and put it into final form for widespread distribution.

Nutrition is also important to health in more ways than one. In Colombia, the division is supporting two projects concerned with different aspects of nutrition and health. One deals with the relationship between malnutrition and internal parasites such as roundworms. The other is investigating recent findings suggesting that even a moderate degree of malnutrition negates the effects of vaccinations against common childhood diseases such as measles, diphtheria, and polio. Both projects will add considerably to the body of



knowledge on the problems of malnutrition and how best to overcome them.

Breast feeding is vital to the nutrition and general health of babies in most developing countries, but the relationships between lactation and fertility, and the possible dangers of using hormonal contraceptives while breast feeding, are still controversial. Through its program for research into fertility regulation methods, the division is supporting a number of projects around the world that are investigating different aspects of the fertility-lactation problem. In Egypt and Mexico, studies are under way to assess the effects of breast-feeding duration and type on postpartum amenorrhea (absence of menstruation following birth). In Chile, a study is being



Studies of Mexican mothers may lead to more effective birth control methods.



Safeguarding the health of industrial workers is an important new field.

made of the effects of new contraceptive implants in lactating women, while in Indonesia researchers are examining the effects of oral contraceptive use during lactation.

The fertility regulation program is also concerned with the development of new, safer contraceptives such as the subdermal hormonal implants mentioned above, which are also being evaluated in terms of effectiveness and acceptance in an IDRC-supported project in Ecuador. Another new development with which IDRC continues to be closely involved is the development of a contraceptive vaccine. The potential of such a vaccine was first demonstrated in the 1970s at the All India Institute of Medical Sciences (AIIMS). Since 1975, IDRC has been supporting a joint program with the AIIMS team and the International Committee for Contraceptive Research to develop the vaccine for widespread use.

The first phase of the project demonstrated that it is possible to immunize a person against a specific hormone in the body and counteract its action in maintaining a pregnancy. The immunity provided varied considerably, however, and in the second phase researchers will attempt to overcome this problem by developing a vaccine that is safe, reversible, and will ensure protection against pregnancy.

A new field of research for the division, one that will likely see increasing activity in the future, was opened up with the approval in 1980 of a grant for a project to study industrial health in Thailand. In common with a number of other developing countries, Thailand is becoming increasingly industrialized, and as the shift from agriculture to industry continues, attention will need to be given to improving conditions to safeguard the health of the workers. The first project will investigate conditions in Samutprakarn Province, which has 1000 factories employing 64 000 workers, and develop a model for improving conditions that could be applied elsewhere in Thailand and in the region generally.



## Information Sciences

If researchers and decision-makers are to work effectively and not to waste time repeating work (and mistakes), they need to be supplied with the information that represents a consolidation of what is already known.

But, in building such a service, no country can be self-sufficient. Even a superpower has difficulty acquiring and processing the information that it needs from foreign sources; a developing country cannot hope, of its own efforts, to construct an adequate information service for its researchers and decision-makers. The solution lies in cooperative information systems. These require each country to

identify and process the information produced in its own territory, and provide mechanisms by which this information is merged into a single index so that each participant obtains the information from the rest of the world.

Since its inception, the Information Sciences Division has strongly supported the establishment of such systems—efforts that are now yielding fruit and bringing about an increasing rationalization of investments. In particular the information system for agricultural science, AGRIS, which is managed by FAO, now has the participation of almost 100 countries, and is reporting more than half of all new agricultural information produced. IDRC has helped particular regions (Latin America and Southeast Asia) to



The AGRIS input centre in Vienna: a global information network.



Above and left: the specialized agricultural information centres provide an invaluable resource to scientists and researchers throughout the world.



establish regional resource bases through which individual countries can participate in AGRIS and from which they can obtain outputs tailored to their needs. With the success of these regional resource centres IDRC is now carrying some of its investment down to the national level and, in the course of the last year, five grants were awarded to individual countries to consolidate their participation in AGRIS.

A similar cooperative information system, DEVSIS, has been proposed to serve the needs of policymakers, ministries of planning, and development banks. IDRC participated in its design and has helped the UN Economic Commission for Latin America carry out pilot experiments on a regional basis. A new program, DEVSIS

Africa, will be managed by the UN Economic Commission for Africa in Addis Ababa, and is being financed jointly by the UN, the UNDP, and IDRC.

Large cooperative information systems provide essentially an inventory of information available in a particular economic sector. The end-user, however, often needs an interpretive information service delivering information in the right language and at an appropriate level of understanding. Hence IDRC has also supported the establishment of specialized information analysis centres on particular topics of high priority for development. For example, since 1975, IDRC has supported the International Grain Legume Information Centre based at a research institute at Ibadan, Nigeria. This



Assisting individual countries to develop the resources to participate in cooperative information programs is a major program component.



centre is now well established, and is expected to become part of the core program of the host institute.

At the regional level the Centre supports projects such as the development of a network of institutions cooperating in a pan-American sanitary engineering information system, based at Lima, Peru, and the establishment of a new Latin American human settlements information network, to be based at Bogota, Colombia.

The highly-acclaimed magazine *Famille et Développement*, first published with IDRC support in January 1975, is now the responsibility of a new organization, l'Association africaine d'éducation pour le développement, which will continue its publication with support from a consortium

of donors. Also, an extremely successful network of institutions engaged in industrial extension work—TECHNONET Asia, covering nine countries of Southeast Asia—became incorporated under the laws of the Republic of Singapore. The program thus ceases to be one administered directly by IDRC, but a grant will give partial assistance to the operations of the new institution over the next three years. During this time it is expected that TECHNONET Asia will, among its various other programs, ensure the training of another 500 extension officers to serve the needs of small- and medium-sized industries in the region.

In Ottawa, the division continues to maintain MINISIS, a set of computer programs that have proved extremely useful for the management of libraries, as well as the recording and retrieval of bibliographic information and other types of data. Three private companies have signed agency agreements to market MINISIS commercially in Western Europe and North America, but IDRC continues to provide MINISIS free-of-charge in developing countries. The national documentation centre (CND) in Rabat, Morocco, for example, already has a machine-readable file of 100 000 Moroccan documents and, with its MINISIS installation, will be putting on-line terminals for information retrieval in several government departments as well as in the principal provincial planning agencies.

The IDRC library continues to provide service to Centre staff as well as the Canadian community concerned with Third-World development. IDRC's own computer can provide information retrieval services to any Canadian institution that connects to it by telephone. The data bases available for searching are those created within IDRC (the library, the Canadian DEVSIS experiment, and SALUS—information on health care services in rural areas of developing countries), as well as those obtained by agreement from four of the UN agencies particularly concerned with development work.



**TECHNONET Asia trains industrial extension officers to help make small industries more efficient.**



## Social Sciences

One of the major concerns of the division's economics unit is the question of food production. Thus the division continues its support for the International Food Policy Research Institute at one level, while also supporting a number of economic studies in the agricultural sector that deal with some of the basic issues confronting farmers in the developing countries.

In Sierra Leone, for example, IDRC is supporting a study of the economics of cassava, the second most widely grown food crop in the country after rice, with a view to finding out what are the relative advantages to the farmer and to the country of cassava production over rice. In Nigeria



Economic studies of the agricultural sector can help develop more effective marketing policies.

there is support for a research project to study the relative efficiency of both large and small farms, and to develop an agricultural strategy that will lessen the country's present dependence on food imports.

Efforts to increase food production can often be undercut by inappropriate marketing policies, however, as farmers will quickly reduce production in response to low prices. In Ivory Coast the division is funding a study of agricultural marketing at its primary level—between farmer and initial purchaser—to gain a better understanding of the workings of primary markets. Data from the study will be made available to policymakers in other countries of the Sahelian zone.

Production and marketing are only two of the factors to be analyzed in a wide-ranging project in Thailand that will study the social, cultural, and economic constraints to development. Researchers will examine the successes and failures of development efforts in Ayutthaya province over the past decade and try to isolate the factors that determined what went wrong, and what went right. The resulting report should have application well beyond one small area of Thailand as a contribution to understanding the impact of development programs.

Population is another important factor in the development equation. The negative effects of high growth rates are well documented, but only relatively recently have governments and agencies come to recognize that family planning programs alone are not sufficient to reduce fertility to manageable levels. The division is supporting a two-year study of integrated programs in three countries—Indonesia, Korea, and Thailand—where family planning services are made available as part of a wider development strategy. By comparing the different approaches, the investigators will be able to evaluate, for the first time, the effectiveness of integrated population programs and provide policy recommendations to government planners.

The study of the movement of populations is also important in development planning. In Upper Volta the division has been supporting a detailed survey of population migration between rural areas, from rural to urban areas, and to neighbouring countries. The project has also helped to develop a research capacity in the country, and this will be strengthened in a second phase that will analyze the relationships between migration patterns and local socioeconomic conditions. In Paraguay the division is supporting a study of the effects of heavy in-migration resulting from the construction of the Itaipu Dam. As in Upper Volta, the project will increase the research capacity of the country in a field in which it is presently weak, as well as obtain valu-

able data for regional development in the area to be affected by new hydroelectric projects.

Infant mortality is one particularly sensitive indicator of socioeconomic conditions in any community, and one that can shed light on the impact of various forms of social services. Over a 25-year period to 1971 the infant mortality rate in Sri Lanka dropped from 141 per thousand to only 43. However in the late Seventies there were signs of a slight upward trend to 47 per thousand. The Centre is supporting a project to study the factors affecting infant mortality in the island over the past 20 years, and to make the results available to assist government policymakers in planning investments in socioeconomic development and public



**Analysis of population migration in Upper Volta provides data for the development planners.**

health programs.

Probably the most costly of social services in most developing countries is education, especially in countries that are attempting to expand their school systems rapidly to make education universally available. Egypt, for example, some time ago set 1981 as the target date for universal primary education. As part of the ambitious program the government introduced the "one-classroom school" as an economical nontraditional approach to providing a flexible education service to remote rural areas—there are now more than 3500 of these schools. With the support of an IDRC



grant the Egyptian National Council for Educational Research is evaluating a sample of the schools to assess their effectiveness and prepare policy recommendations for the next phase of the country's educational expansion.

Colombia is another country making a major effort to increase both the quantity and the quality of education available to its people—to the point where education now accounts for 20 percent of the national budget. The division's education unit is supporting several related projects in Colombia. One is to study the cost-effectiveness and efficiency of rural primary schools to assist in the future allocation of resources. A second is concerned with the factors, both in-school and out-of-school,

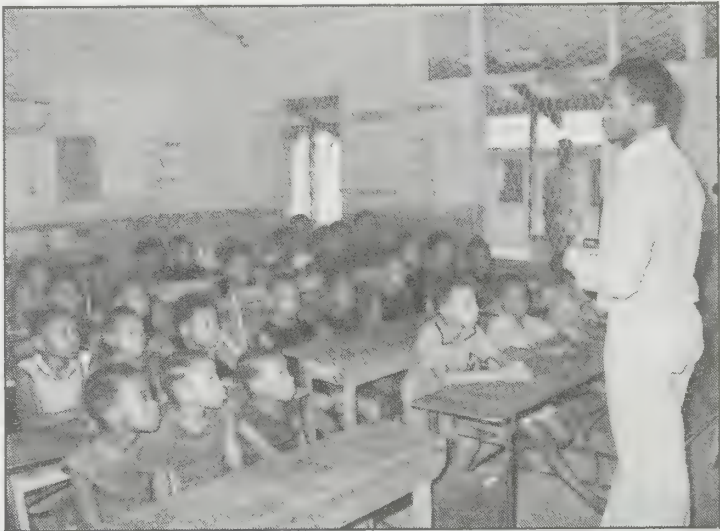
that affect the acquisition of literacy and the habit of reading. And a third is evaluating the level of achievement in primary schools and developing the necessary testing instruments for future evaluations as the country attempts to improve the standard of education and eliminate regional disparities.

Similar projects concerned with primary school achievement are being funded in Nigeria and Thailand, while in India researchers are tackling the question of achievement from the viewpoint of the child with "learning disabilities."

Another aspect of education requiring investigation is the effectiveness of the teachers themselves. In Sierra Leone a project arising out of an IDRC-supported



Egypt's one-classroom schools: providing the most education at the least cost?



In Sierra Leone the effectiveness of traditional teaching methods is being evaluated.

seminar is pioneering a new methodology to establish a profile of "the effective teacher." The teacher evaluation will be based on criteria developed in the country, and the resulting profile compared to those used in industrialized countries. Thus the researchers hope their findings will be of direct use to teachers' colleges, both in the preparation and evaluation of future teachers.

In the drive for development many countries face difficult choices in the areas of resource exploitation and industrial strategy. This dilemma is well illustrated in the case of the proposed copper mine at Namosi on the main Fijian island of Suva. As the single largest development in the region, the mine will produce profound changes in all aspects of Fijian life. The

division's science and technology policy unit is supporting a research study to fully evaluate all the technology policy options for the exploitation of the island's copper, and to describe for the government the positive and the negative effects of the venture, both during construction, and under continuous operation.

Brazil, "the giant of Latin America," also faces difficult choices in its efforts to expand the economy. Choices for instance between large- and small-scale production, between efficiency and employment, between traditional and modern technologies. Two new IDRC-supported projects are aimed at providing the data needed to help the government arrive at the right decisions for this stage of its development. One is a study of the role of small- and medium-sized businesses and their contribution to the growth of employment, and the other will examine the effects of radical technical change on workers in the textile industry. And in neighbouring Argentina, which also has a rapidly growing industrial economy, the division is supporting a study of the role of state purchasing power in developing the nation's technological capacity. The project will concentrate on the electronics industry, but will also develop a methodology that can be used in other similar case studies.

The study of technology policy in the developing countries has been relatively neglected in the past, due at least in part to a shortage of qualified researchers. Since 1976, the division has supported a successful program of training in technology policy studies through the Science Policy Research Unit of the University of Sussex, England. Building on this experience, and using much of the material developed in the initial program, the division will now support a series of training workshops for science policy researchers in Africa, Asia, and the Middle East. The Ottawa-based program is expected to train approximately 60 researchers and policymakers over a two-year period.



There is no such thing as a "typical" project in the files of IDRC. More than 900 were approved during the Centre's first decade, and some 350 have now been closed, although for most of those the end of the research means only the beginning of the next stage—implementation. To cull from those files just four, one for each program division, to represent the past ten years, was not an easy matter.

Nor is there any such thing as a completely successful project, or a complete failure. For even if a project failed to meet any of its initial objectives it would still have provided a valuable learning experience, and demonstrated to future researchers that this is not a promising avenue for investigation. More often than

not, however, a project meets most of its objectives, and is concluded on a more positive note. And in that sense these projects are typical: all had positive outcomes, all had problems to overcome, and their impact can be seen in activities going on today.

Beyond that, they were selected for the purely subjective reason that they make good "stories." For that is what the following pages are, not scientific evaluations (those have already been written), but a reporter's view of how and why the projects came into being, where they succeeded, where they failed, and what happened when the research was completed.





## Our Magazine

An African village is rarely quiet. During the day small children are at noisy play. Women chant in time to the hollow pounding of the grain for the evening meal. A group of old men argue in the shade of a tree. Dogs, birds, and roosters add their shrill notes to the cacophony of sound.

Beneath another tree a young man raises his voice to be heard above the din as he reads aloud from a tattered copy of *Paris Match* that is at least a year old. His attentive listeners hang on every word; yet most of these Senegalese villagers have never traveled further than the nearest market town, and have no concept of where or what Paris is.



Village meeting in Senegal: plenty of talk, but not much to read.

Although literacy levels throughout most of Africa are among the lowest in the world—and the French-speaking Sahel region is no exception—the number of literate adults has doubled in the past two decades. But for those who can read there is precious little relevant material to be had, especially in the countryside.

In the cities there are locally published newspapers, and some library facilities. A few magazines are displayed on newsstands, but most of these are imported from other continents, deal with other cultures, and are very expensive. On street corners in most towns and cities there is a brisk trade in used magazines. Some are sold time and time again. Eventually a few may reach the villages ... like a year-old copy of *Paris Match*.

Coupled with this problem of lack of local media, is the need to get more

information out to the people, particularly messages about family health, contraception, hygiene, nutrition, and other development-related topics. This region of Africa has one of the highest birthrates in the world, at 47 per thousand almost double the global average. It also has a tragically high infant mortality rate of more than 150 per thousand births. Disease and malnutrition are endemic, and the average lifespan is just 48 years, compared with 72 for the average North American.

A large part of the problem is simply ignorance: lack of knowledge. As recently as 1975, for example, Mali was the only country in French-speaking Africa with an officially sponsored program of family planning and child care information.



The region has a tragically high infant mortality rate — double the global average.

Put these two problems together and what you have is a ready-made market for a popular regional publication providing information on family health and development. That at least was the proposition put forward by the participants from 11 countries who attended the region's first seminar on sex education in Mali in 1973. The idea was more clearly defined at a meeting sponsored by IDRC's Information Sciences Division later the same year, and soon took shape as a project proposal.

Once the project was approved by the Centre's governors, an international editorial board was formed, temporary space was made available in IDRC's regional office in Dakar, and the two people who would see the publication through its first crucial years (a Swiss sociologist and a Senegalese journalist) toured the region seeking ideas and support. And within a



year the first issue of *Famille et Développement* was on the press.

From the beginning the magazine's success surprised even its most optimistic backers. With every issue the print run was increased—and every issue was sold out. (In fact the first few issues were distributed free, but once a price was attached the demand slowed hardly at all.) Although the price was deliberately kept low in view of the magazine's orientation to development education, second-hand copies usually sold at a premium.

On press days the scene at IDRC's Dakar office was chaotic, with the tiny staff of five scrambling to label and distribute the bundles of magazines as fast as the printer could deliver them. Distribution bot-

editorial style was outspoken, and the layout and design rivaled anything to be found on the newsstands.

In spite of early teething troubles the magazine quadrupled its circulation to 20 000 in its first three years, and attracted favourable reviews from such diverse sources as the *Toronto Globe and Mail* and the *Christian Science Monitor*. Its readers were unanimous in their praise. Many were teachers, who used material from the magazine in their classrooms—in Togo the magazine is in fact sold by the Ministry of Education. Others were public servants who were able to use the information the magazine gave them in day-to-day contacts with the public.

In short they were the "opinion makers"



Senegalese journalist Marie-Angélique Savané was first editor of the new magazine.

tlenecks, lack of sales networks, and losses in the mail presented considerable problems in the early days. Sometimes as many as three-quarters of the copies mailed in Senegal were "intercepted" before they could reach the subscribers. Many subscribers simply gave up and bought from newsstands instead. But in Chad, a country twice the size of France, there were only three bookstores selling international magazines. As an ingenious solution to that problem it was proposed to market *Famille et Développement* through government beer stores!

Like any publishing enterprise the magazine also had its share of "gremlins"—illustrations that somehow appeared upside down or in the wrong place, paragraphs that unaccountably disappeared from articles en route from editor to printer. But the overall standard was remarkably high, the



the magazine was intended to reach, and as such they increased its audience many times over. A readership survey carried out in Senegal indicated that there was an average of 10 readers for every copy.

Almost as surprising as the magazine's instant popularity was its fearless approach to such highly sensitive issues (politically and culturally) as women's rights, prostitution, and abortion. There had been pessimists at the outset who predicted that an editorial board composed of representatives of eight countries would be unable to agree on controversial issues. In fact the editorial board proved to be one of the strengths of *Famille et Développement*, and there were very few complaints about "objectionable" material.

But in spite of its obvious success, the magazine was a financial failure. Because of its non-commercial nature it attracts very



little advertising, and revenue from sales does not come close to covering costs. After three years the research aspect of the project could be said to be completed—the original hypothesis conclusively proven. But rather than abandon its "baby" at this point, the Centre agreed to a further period of diminishing financial support, during which the "Africanization" of the project would also be completed.

That goal was accomplished by the establishment of ASAFED, a non-profit organization based in Dakar and supported by most of the African nations involved in the project since the beginning. Other contributions now include the development assistance agencies of Canada, Sweden, Switzerland, and the United States, the Ford and Rockefeller Foundations, and the United Nations Fund for Population Activities. The IDRC's financial commitment is now minimal.

As for *Famille et Développement*, it is now housed in new offices, still in Dakar. It has new editors and a slightly larger staff. Its approach to the issues of development is as fearless as ever. Circulation is now near the 30 000 mark, making it one of the most successful magazines produced in Africa by Africans. And its readers still call it "our magazine."

## Homes away from Home

Although the main thrust of the Centre's research support has been, and continues to be directed at improving the living standards of the rural poor, the needs of the urban poor cannot be ignored. In fact the two problems are inextricably interrelated, because huge numbers of the squatters and slum dwellers in the Third World's cities are migrants from the countryside.

The populations of the major cities of the Third World are growing at a much faster rate than the country as a whole. Rural-urban migration is one of the principal causes, and it is bringing about a rapid shift in the balance of population.

City dwellers numbered about one-in-



Rural-urban migration is causing a rapid shift in the balance of population.

five of the population of the developing countries in 1970. By 1980 they numbered about one-in-four. It has been conservatively estimated that the figure will be one-in-three by the end of the century. More pessimistic projections call for fully half the Third World's population to be living in cities by the year 2000.

Such projections have to be called pessimistic because of what they are likely to mean in human terms. Cities like Bombay, Calcutta, Manila, Cairo, Peking, and Jakarta could have populations approaching 20 million by then. They are already being called the super cities of the future. But if present trends continue the only thing super about these and other Third World cities 20 years from now will be their size.

Most of these cities are already overcrowded and struggling to provide even



basic facilities for their burgeoning populations. In 1973 the UN reported that a large proportion of the urban population of the least-developed countries was living in housing at densities and in conditions that present a serious hazard to health and safety. The most immediate problem that presents itself on contemplating the next two decades is: where and how will the cities house all those extra millions?

The causes and possible cures for rural-urban migration have long been the subject of extensive study throughout the Third World, but in the early Seventies the Centre's Social Sciences Division was quick to recognize the need for another kind of study. Very few countries, or cities, had any kind of coherent urban housing policy, or

number of visitors from other cities, all wanting to know what had been done, how it had been done, what worked, and what didn't, the research director wondered aloud if some better way could be found to share Singapore's experience.

The project that developed as a result of the conversation differed somewhat from the original concept. It became an eight-country cooperative study, with the emphasis on a mutual sharing of experience, comparability, and common themes. In addition to Singapore and Asia's other city-state, Hong Kong, the countries that took part were Indonesia, Laos, Malaysia, Philippines, Sri Lanka, and Thailand. The primary target of the project was the preparation of a series of national studies of



Overcrowded cities in Southeast Asia present a major problem for the authorities — and the people.

had undertaken studies of the kind of low-cost housing options available to them. The problems are particularly acute in the densely populated countries of Southeast Asia, and it was here in 1972 that an ambitious eight-country low-cost housing study project was begun.

The project grew out of a conversation between one of the Centre's program staff and the research director for the Singapore Housing Development Board about the successes and failures of Singapore's housing programs. Because it is a relatively wealthy city-state with a very high population density, Singapore recognized the need for housing policies and programs earlier than most, and was able to act.

Over the years Singapore gained a great deal of valuable experience, and began to attract attention. Faced with an increasing



Singapore's highrise housing program has attracted visitors from many Asian cities.

housing conditions and needs.

It is perhaps indicative of the Centre's early stage of development, that when the participants were first brought together to discuss the design of the low-cost housing project, they found themselves ensconced in the plush surroundings of the elegant Singapore Hilton. And it is perhaps indicative of the nature of that group—not a Western expert among them—that the majority of them ended the day's discussions over bowls of noodles and some satay bought from street vendors in the hotel car park!

As it turned out the participating countries faced many common problems in spite of considerable physical and cultural differences. Cities such as Jakarta, Manila, and Kuala Lumpur, for instance, actually have greater population densities than ei-



ther Singapore or Hong Kong. Yet only the two city-states at that time had definite housing policies and programs, with specific agencies to implement them. The others had only relatively recently begun to appreciate the seriousness of the problem and taken steps to do something about it.

The studies, meetings, conferences, and exchange visits lasted almost three years. Usually with social science projects it is difficult to produce "concrete" results. One cannot point to increased crop yields or count numbers of health workers trained. But this project was something of an exception. First there were the national reports—only paper, to be sure, but in almost every case the first report of its kind in each country. So important were they considered that some are now being used as standard textbooks for training city planners.

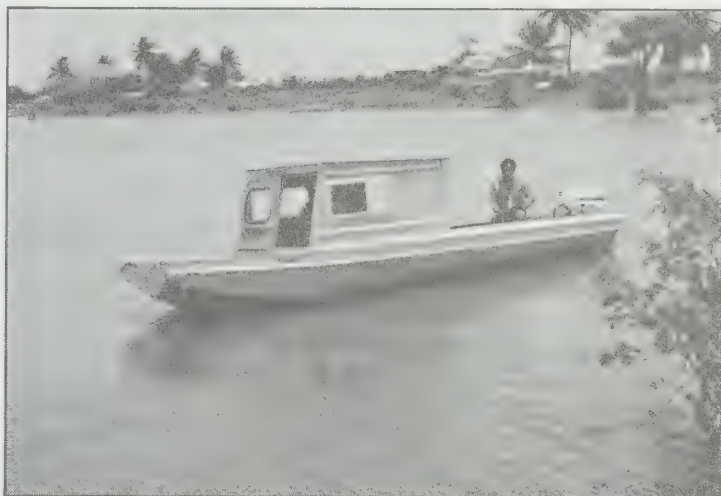
In some of the participating countries new institutions were created as a direct result of the study team's recommendations, such as Thailand's National Housing Authority or Indonesia's Urban Development Corporation. Singapore helped in setting up both agencies and also assisted the Philippines in drawing up a national housing policy and plans for urban renewal in Manila. Thailand was able to assist Laos in the preparation of its reports and recommendations.

But it is perhaps in the less tangible areas that the project will eventually have its greatest impact. This was the first project of its kind to bring together researchers and policymakers interested in housing in the Asian region. It pioneered the "network" approach that has been widely used by the Centre since. And it demonstrated beyond question the value of bringing together developing country researchers to collaborate on the basis of mutual experience.

## The Medex Solution

The little blue launch noses its way steadily upstream, cleaving the muddy brown waters of the broad river. Dense bush on either bank gives way to cleared farmland, and here and there houses appear near the water's edge, built high up on stilts to keep them above the flood level. This is one of many isolated villages scattered through the interior of Guyana. The river is virtually the only way in or out. It is the village people's lifeline.

Two women in a well-laden canoe call a greeting as the blue launch pulls in to the riverbank and a young man scrambles ashore clutching a large bag. He hurries to one of the houses, where he is quickly



**Medex on the job: making housecalls by launch in the Guyanese interior.**

ushered inside by an anxious mother. The sick child is lying on a bed in the one main room. A swift examination reveals a slight fever, a minor infection, easily treated. The child also has parasites, he knows, and he stresses the importance of hygiene once again as he explains to the mother the treatment for the child's ailment.

Then back to the launch to head downriver to the clinic. Another routine house call for the bush doctor? Not quite. This young practitioner is not a doctor, he is what is known in health services jargon as a "physician extender." To the people on the river he is known more succinctly as "the medex."

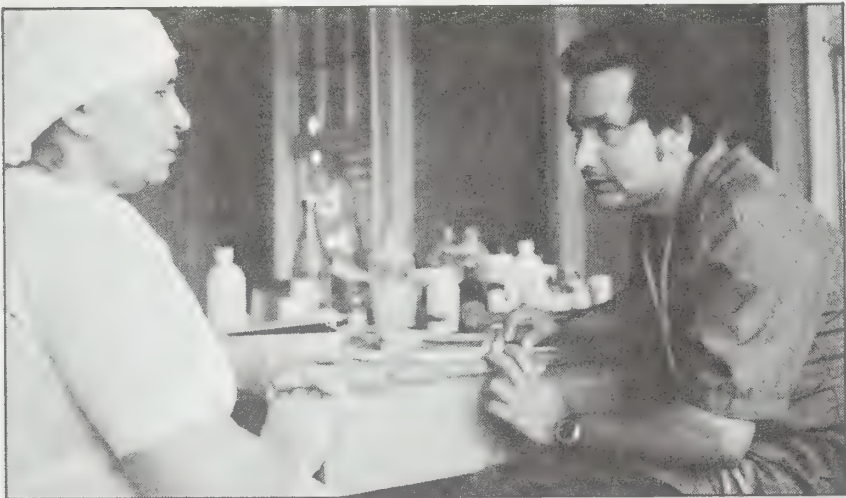
Guyana is a former British colony, a little English-speaking enclave on the South American continent. Sometime in the future Guyana's 215 000 square kilometres, much



of which is virtually uninhabited, may yield some of the rich resources enjoyed by neighbours such as Venezuela and Brazil. But in the meantime this is not a rich country, and for the rural people of the hinterland life is generally a matter of subsistence.

Guyana has no facilities for training doctors, and as a result there are less than 100 physicians in the country, perhaps one-third of them expatriates working on contract. Ten years ago there were maybe 170 doctors, but many leave for better pay and working conditions in the United States or Britain. Like so many other developing countries, Guyana is also a victim of the brain drain.

In the long run the solution is to improve



**In a country with less than 100 doctors, the medex is appreciated by the rural people.**

conditions at home so that the doctors may be less tempted to leave. And at the same time the government needs to find a way to bring better basic health services to the people of the hinterland.

The medex approach was adopted by the University of Hawaii as a strategy for delivering health services to small populations in isolated areas such as the Micronesian Islands. The key to the system is the establishment of a corps of specially trained middle-level health workers who can provide not only preventive and curative service, but are also health promoters and managers. One of the basic shortcomings of many rural health care delivery systems has been the absence of such an intermediate level to bridge the gap between the community health worker (who can be trained and supervised by the

medex) and the formal health system.

Guyana's Ministry of Health was impressed with the medex approach and determined to try to adapt it to their situation. They sought help from IDRC and the Health Manpower Development Staff of the University of Hawaii to implement their plan. IDRC's first involvement was to provide study grants for seven Guyanese health professionals to take intensive courses in training methodology. The government meanwhile took steps to prepare for the new system, even drafting legislation to provide a legal framework within which the medex would operate.

The plan was for an integrated project. Arrangements were made with the University of Guyana for formal recognition of the medex training, and a cadre of village health workers was to be trained using the same modular learning approach as for the medexes themselves. Nothing less than a reorganization and strengthening of the country's health infrastructure was called for.

With the training of the core group complete, the Ministry decided to undertake a three-year demonstration program. IDRC and the University of Hawaii agreed to provide support. The program began auspiciously, with new quarters in a refurbished government office building ready in good time to begin training the first group of would-be medexes. There were 16 in that first group, and by the end of the project a total of 61 men and women had been trained.

But the developments that were supposed to accompany the training and placement of medex personnel did not move at the same pace. As a consequence placements had to be limited to areas where there was already adequate support. Nevertheless 45 medexes were placed in hinterland rural posts, and 11 in needy areas around the capital, Georgetown. The remaining five, having gained some field experience, were brought back to headquarters to serve as tutors and supervisors.

Supervision proved to be another difficulty in the demonstration project, largely because of a shortage of government medi-



cal officers—in one instance a single medical officer was expected to cover a territory of some 75 000 square kilometres. So the project staff themselves provided most of the supervision. To keep all the medexes in touch they produced a bi-weekly newsletter, and for those in the most isolated postings a weekly radio hook-up provided the opportunity for discussion, advice, and encouragement.

Time and again the project staff were obliged to improvise as the integration of the medex into the existing health system was delayed by a complete review of the country's health services begun in cooperation with the Inter-American Development Bank after the project had started. The training of village health workers was also delayed. But in spite of difficulties and its shortcomings, the medex program showed that it could work.

The medexes have come to be accepted, and for the most part respected, both by the public and by other health professionals in the country.

The experience will prove invaluable in the next stage—the large-scale expansion of the program with the assistance of a multi-million dollar grant from USAID. But, as an independent evaluation of the three-year experiment pointed out, if the program is to bring about improvements in the health of the Guyanese people, there must be even greater emphasis on measures designed to improve health, rather than on the treatment of the sick.

For the medexes themselves the dilemma is a painful one, for there is a great need for conventional health care. Health promotion is time-consuming, and there are only 24 hours in a day.

On a ferry crossing the Essequibo River to one of the islands served by the medex, a woman sums up the success and the shortcomings of the project in a single sentence: "I tell medex not to work so hard, for if he gets sick who is going to take care of us?"

## Rice Plus

It is the dry season in the Philippines. The rice fields around the village are dry and almost deserted. Except for one small area where a half-dozen farmers have got together to try something new—their fields are green again.

What the farmers have done is dig a few shallow irrigation wells—there is still water not far below the surface—and plant cucumbers. Their neighbours watch and wait, and see the six enterprising farmers carry off bushels of cucumbers to market, where they sell for hard cash.

Next year at dry season, 56 farmers are at work in their fields, growing not only cucumbers but watermelons, mung beans,



**Rice farming in the Philippines: many farmers still grow only one crop each year on small farms.**

and a few other crops. The weather is good, and so is the harvest. Everybody makes a little money, bank loans can be repaid, and a lesson has been learned: the fields need not lie idle in the dry season.

That incident took place in the early Seventies, and it has been repeated time and again throughout the Philippines and a dozen other countries in Asia ever since. What the farmers are doing is adopting a system called multiple cropping. The practice itself is not new, since ancient times farmers in the tropics have used forms of multiple cropping, usually to meet the needs of subsistence farming.

What is new is the scientific study of some of these traditional techniques, and the development of cropping systems that have been known to produce as many as nine vegetable crops from the same piece



of land in a year. The potential for intensifying small-farm production in the densely populated regions of Asia is enormous.

This potential was recognized by researchers at the International Rice Research Institute (IRRI), in the Philippines, at about the time IDRC was being formed. IRRI is one of a number of specialized agricultural research centres around the world supported by an international group of donors. New, high-yielding rice varieties developed there had revolutionized rice farming, but still many farmers would grow only a single crop of rainfed rice. In a region where the average farm is about two hectares, and the labour force is increasing at about two percent a year, labour-intensive multiple-cropping systems



**Researchers must find the best combinations of crops to improve both diet and income.**

seemed to offer many benefits.

So IRRI decided to broaden its scope to explore the total food production capability of the tropical rice farmer. In a proposal setting out the rationale for the new program the Institute's director and associate director wrote: "Perhaps mankind's greatest challenge during the next two or three decades is to ascertain and more nearly achieve the crop production potential of the tropics."

IDRC's part in helping to meet this challenge began in late 1971 as one of the earliest projects of the Agriculture, Food and Nutrition Sciences (AFNS) Division. The Centre had been approached by both IRRI and the University of the Philippines College of Agriculture (UPCA) to support closely related research proposals dealing with research, training, and adoption of

multiple-cropping systems.

At IDRC's suggestion the two proposals were combined into a single project for an initial two-year period. The Centre eventually supported the research program through several successive phases until 1978. Out of this research grew a network of cropping systems projects in a dozen Asian countries, some of which the Centre is still supporting today, all based on the IRRI/UPCA experience. Cropping systems research has become one of the largest components in the AFNS Division's program.

As the original project proposal stated, a great deal of well-planned research needed to be done to achieve the "maximum potential" the researchers were seeking. Why, for instance, do certain crop combinations have the effect of reducing insect infestations? These biological control mechanisms needed study. Why do some crops grow well together, or in sequence, and others not? Both types of interactions must be studied before new cropping systems can be recommended to the farmers. And what of nutrition? What are the best combinations of crops to improve the people's diet as well as their incomes? And there were the socioeconomic considerations, the need for improved supplies of fertilizer and seed, the reluctance of banks to extend credit to small farmers, and the reluctance of small farmers to risk everything on the word of a technician from the university.

The university radio station ran programs, prepared by the agricultural technicians, aimed at encouraging the adoption of multiple cropping. But nothing succeeds like success, and as soon as the new systems could be seen to work, farmers began to seek more information. For the successes could be spectacular. One hard-working farmer raised a crop of eggplant after the rice harvest and made enough money to buy a second-hand "Jeepney" which he now uses to transport goods and people—and further supplement his income. More commonly the farm family uses the extra money to add an extra room on the house, to buy furniture or a television, or to improve the farm.



It was not all smooth sailing, however. A nutritional study of 300 schoolchildren in six villages, and a survey of people's eating habits showed that the extra crops had brought little dietary improvement—the people were selling them, not eating them. The need for nutrition education was evident, and here the radio again proved a useful tool—although there was a lengthy period when martial law was in effect in the Philippines, and the radio station was obliged to shut down.

Training was a major component of the program from the beginning, with concentration on the principles of crop production, pest management, and economic evaluation of cropping systems. To bring home to the trainees the realities of small-scale farming,



One enterprising farmer made enough extra cash to buy one of the Philippines famous "Jeepneys".

a Canadian at IRRI devised a "simulation game," in which the players become small farmers and face the vagaries of the weather, insects, pests, and fluctuating markets in order to make a living for themselves and their families.

The game was played with enthusiasm on Saturday mornings, and for the trainees who did not come from farm backgrounds, it was said to be a sobering experience.

As the program developed, dozens of researchers and extension workers came to IRRI each year to attend courses in multiple cropping. Today they form the nucleus of the cropping systems research network that is bringing new life to farm villages from Bangladesh to Bali, and a dozen other locations throughout South and Southeast Asia.



The changes that have taken place in the world during the first decade of IDRC's existence have perhaps a greater potential for changing the direction of human development than those of any other period of history.

In political and economic terms there has been a massive shift in power. A shift that is not yet complete, and the implications of which reach far into the foreseeable future.

Socially, the world has passed through the postwar "baby boom," and the population curve has peaked. As birthrates fall and improved health increases lifespans, youth will no longer form the majority in our societies.

Technologically, the Seventies was the decade of the microchip. Where that revo-

lution will end there is no telling, but it will affect all our lives far more profoundly than did Henry Ford's first production line.

As we enter the Eighties—IDRC's second decade—there are robot spaceships voyaging among the outer planets, the major powers have weapons enough to destroy the world many times over, as if such an absurdity were possible. And still there are people in some countries starving to death. Still there is no cure for the common tropical diseases that cripple tens of millions of people. Still more than half the world's people cannot read.

The more things change, it seems; the more they stay the same.

What will be IDRC's role in the difficult decade ahead? To some extent it will be





more of the same: more support for research to meet the needs of the developing countries, more science and technology for development. But with an added dimension, the new responsibility of providing a "focal point" for Canadian universities and research institutions in the service of international development.

There will also be an even greater sense of urgency. Just as the Pearson Report (Partners in Development) closed the optimistic Sixties, the Brandt Commission's report (Program for Survival) closed the sombre Seventies. The Brandt Commissioners warn of "the immense risks threatening mankind" not only from the collective insanity of the arms race, but also from the fundamental inequities that continue to divide our world into rich and poor, North and South, even after two "development decades."

The Brandt Report sets out a program of priorities for the next two decades. Heading the list are the needs of the world's poorest countries, particularly what the report calls "the poverty belts" of Africa and Asia. These too will remain priorities for IDRC.

Increasing urbanization and industrialization in the developing countries, however, are likely to have a growing impact on the Centre's programs. Already rural-urban drift has resulted in farm labour shortages in some regions. Agricultural mechanization is one solution, but where will the energy come from? The Eighties have been declared the International Water and Sanitation Decade by the UN—another field of research on which the Centre continues to place high priority.

The choices that lie ahead for the planners, the policymakers, the politicians, and the scientists of the Third World will not be easy ones to make. The role of the Centre will continue to be that of both an adviser and a catalyst in the search for what the Brandt Commission calls "a more humane social and economic order."

Disseminating the results of research supported by the Centre, and promoting the importance of international development research are the dual roles of the Centre's Communications Division.

Under its publications program the division produces not only scientific monographs and technical studies, but also a wide range of publications of a more popular nature aimed at informing non-specialists of research findings and their implications. A quarterly development-oriented magazine produced in three language editions, and a monthly science feature service for the news media, are among the materials produced for a more general readership.

The division currently distributes approximately 100 000 publications around the world each year. Many of these are distributed free to researchers and institutions in the developing countries. Most titles are available for purchase through booksellers in other countries.

The division's small audio-visual unit produces films for both educational and training purposes, to demonstrate research techniques, and to illustrate the work supported by the Centre. Copies of IDRC films have been distributed around the world, and several have been aired on television in Canada and abroad. A variety of other audio-visual materials is produced, and the division also maintains an extensive photo library.

In recent years the division has organized information seminars in cooperation with institutions in various regions of Canada, and provided exhibits at numerous international conferences. From time to time the division's staff have also been called upon to provide advice and assistance on communications matters to institutions in developing countries.

The following is a list of publications and films produced by the division during 1980. Catalogues of all current materials are available on request from: Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9.



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L'homme et l'arbre en Afrique tropicale: trois essais sur le rôle des arbres dans l'environnement africain. Gunnar Poulsen. Ottawa, Ont., CRDI, 1980. 31 p. IDRC-101f (Also available in English IDRC-101e)

Fisheries and aquaculture in the People's Republic of China. G. I. Pritchard. Ottawa, Ont., IDRC, 1980. 32 p. IDRC-115e

Herramientas de progreso: ciencia y tecnología para el desarrollo. David Spurgeon, editor. Bogota, CIID, 1979. 214 p. IDRC-131s (Also available in English IDRC-131e and French IDRC-131f)

Acronyms relating to international development/ Liste de sigles en développement international/ Siglas relacionadas con desarrollo internacional. Compiled by Margaret Carroll. Ottawa, Ont., IDRC, 1980. 162 p. IDRC-138e,f,s

Diez años del Grupo Andino: memorias de un protagonista. M. Guerrero. Bogota, CIID, 1979. 432 p. IDRC-140s

Les migrations voltaïques, Tome I: importance et ambivalence de la migration voltaïques. Sidiki Coulibaly, Joel Gregory et Victor Piché. Ottawa, Ont., CRDI, 1980. 144 p. IDRC-147f

Dissemination of scientific information in the People's Republic of China. Kieran P. Broadbent. Ottawa, Ont., IDRC, 1980. 60 p. IDRC-148e

Devindex 1978: Index to 1978 literature on economic and social development/Index de la littérature sur le développement économique et social produite en 1978. Gisèle Morin-Labatut, editor/rédactrice. Ottawa, Ont., IDRC, 1980. 183 p. IDRC-149e,f

Searching: review of IDRC activities 1979. Ottawa, Ont., IDRC, 1980. 40 p. IDRC-150e (Also available in French IDRC-150f and Spanish IDRC-150s)

Cassava cultural practices: proceedings of a workshop held in Salvador, Bahia, Brazil, 18-21 March 1980. Edward J. Weber, Julio Cesar Toro M., and Michael Graham, editors. Ottawa, Ont., IDRC, 1980. 152 p. IDRC-151e

An end to pounding: a new mechanical flour milling system in use in Africa. Paul Eastman. Ottawa, Ont., IDRC, 1980. 64 p. IDRC-152e

SALUS: low-cost rural health care and health manpower training: an annotated bibliography with special emphasis on developing countries. Volume 6. Rosanna M. Bechtel, editor. Ottawa, Ont., IDRC, 1980. 157 p. IDRC-153e

Wastewater treatment and resource recovery: report of a workshop on high-rate algae ponds, Singapore, 27-29 February 1980. Ottawa, Ont., IDRC, 1980. 47 p. IDRC-154e

Rattan: a report of a workshop held in Singapore, 4-6 June 1979. Ottawa, Ont., IDRC, 1980. 76 p. IDRC-155e

International cooperative information systems: proceedings of a seminar held in Vienna, Austria, 9-13 July 1979. Ottawa, Ont., IDRC, 1980. 111 p. IDRC-156e

Le rôle des arbres au Sahel : compte rendu du colloque tenu à Dakar (Sénégal) du 5 au 10 novembre 1979. Ottawa, Ont., CRDI, 1980. 92 p. IDRC-158f

Bamboo research in Asia: proceedings of a workshop held in Singapore, 28-30 May 1980. Gilles Lessard and Amy Chouinard, editors. Ottawa, Ont., IDRC, 1980. 228 p. IDRC-159e

## Technical Studies

Tropical oysters: culture and methods. D. B. Quayle. Ottawa, Ont., IDRC, 1980. 80 p. IDRC-TS17e (Also available in French IDRC-TS17f)

Science and technology for development, STPI Module 1: a review of schools of thought on science, technology, development, and technical change. F. Sagasti. Ottawa, Ont., IDRC, 1980. 56 p. IDRC-TS18e

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Science and technology for development, STPI Module 4: the present situation of science and technology in the STPI countries. A. Araújo. Ottawa, Ont., IDRC, 1980. 67 p. IDRC-TS22e

Science and technology for development, STPI Module 5: policy instruments to build up an

infrastructure for the generation of technology. A. Aráoz. Ottawa, Ont., IDRC, 1980. 59 p. IDRC-TS26e

Science and technology for development, STPI Module 7: policy instruments to define the pattern of demand for technology. S. Barrio. Ottawa, Ont., IDRC, 1980. 91 p. IDRC-TS27e

Science and technology for development, STPI Module 8: policy instruments to promote the performance of S and T activities in industrial enterprises. F. Sagasti. Ottawa, Ont., IDRC, 1980. 27 p. IDRC-TS28e

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Science and technology for development, STPI Module 11: technology behaviour of industrial enterprises. F. Sercovich. Ottawa, Ont., IDRC, 1980. 59 p. IDRC-TS32e

Science and technology for development, STPI Module 6: policy instruments for the regulation of technology imports. Ottawa, Ont., IDRC, 1980. 75 p. IDRC-TS33e

Science and technology for development, STPI Module 12: case studies on technical change. F. Sercovich. Ottawa, Ont., IDRC, 1980. 35 p. IDRC-TS34e

## Other Publications

### The IDRC Reports/Le CRDI Explore/ El CIID Informa

(Michelle Hibler, Editor-in-chief/rédactrice en chef)

Published in three separate language editions, this is a quarterly magazine of report and comment on the work supported by IDRC and on related activities in the field of international development. Total circulation of the English, French, and Spanish editions is about 12 000 per issue, of which approximately 50 percent is to developing countries, 40 percent within Canada, and the remainder to other industrialized countries.

The magazine is published in January, April, July, and October, and is available through the Centre's Communications Division.

## IDRC Features/Reportage CRDI

This monthly news feature service on scientific, technical, and educational subjects pertinent to development, is provided free-of-charge to selected newspapers and magazines in the developing world. During the past year 36 articles, many of them written by IDRC staff, others by selected contributors, were distributed in English and French to some 300 publications in 74 countries. Although it has not been possible to obtain a complete record of the number of *IDRC Features* actually published, it is known that the series is widely used and appreciated, with clippings and comments being received from Argentina to Zambia.

### IDRC library bulletin/Bulletin de la bibliothèque du CRDI, Ottawa, IDRC/CRDI.

## Films

### *Fish by-catch . . . bonus from the sea.*

Shrimp trawlers dump millions of tons of edible fish into the sea every year. This film shows how one country—Guyana—set about preventing some of that waste of food, and succeeded. Produced and directed by Neill McKee. 16 mm colour, 13 minutes. (Also available in French and Spanish.)

### *Choices.*

This film illustrates the wide variety of approaches being tried by researchers and planners of the Third World in their efforts to harness science and technology to meet their development goals. Produced and directed by Neill McKee. 16 mm colour, 28 minutes. (Also available in French.)

### *A message from African healers.*

This film is a documentary about traditional medicine in Zaire. It is a synthesis of two longer films made by researchers of the Scientific Research Institute of Zaire as part of an IDRC-sponsored study. Produced by Neill McKee. 16 mm colour, 25 minutes. (Also available in French.)



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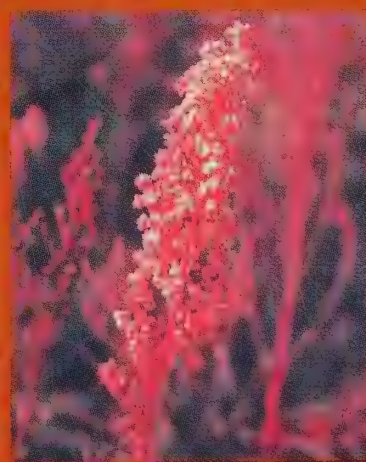




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## Review of IDRC Activities 1981



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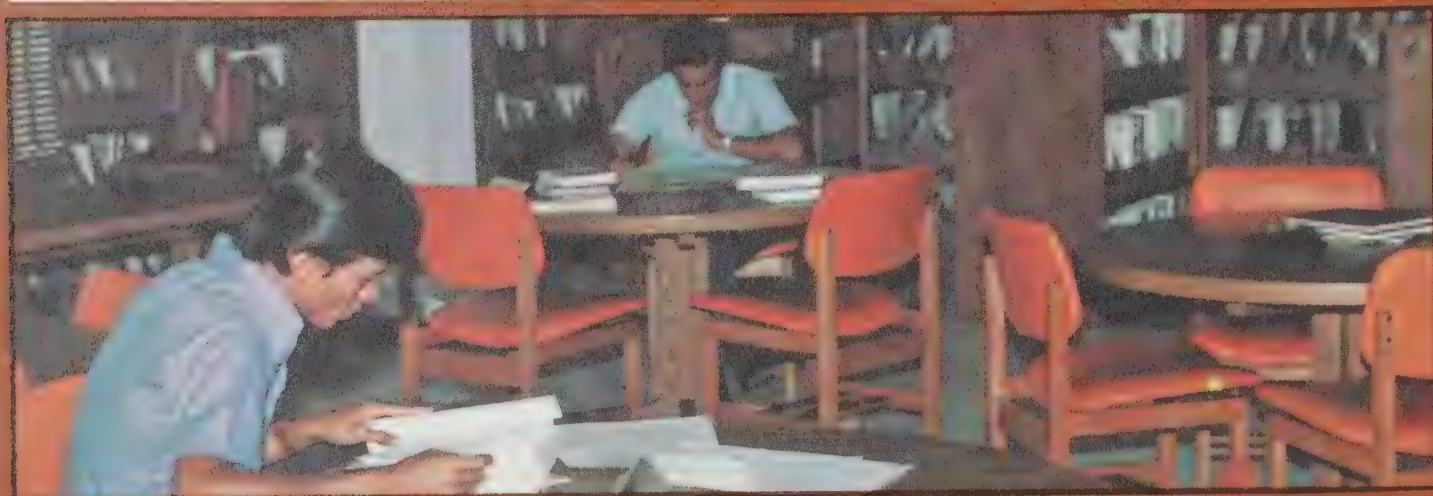
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The year 1981 might well be called the Year of the Summit. Four such extraordinary, multinational gatherings took place: the Western economic summit in Ottawa, the Commonwealth Heads of Government meeting in Melbourne, The North-South summit in Cancun, and the Francophone African deliberations in Paris.

Canada played significant roles in the first three of these meetings, but what is more important is the fact that, at all of these gatherings, the leaders of the developed and the developing countries alike publicly recognized their interdependence. That might seem a very small step, but in attitudinal terms, it marks a considerable breakthrough — and one long overdue.



**IDRC President, Ivan L. Head, visits a Centre-supported project in East Africa.**

It is short-sighted to assume that North-South relations are played according to the rules of a zero-sum game in which each point gained by one participant is a point lost to another. International development, in fact, is a mutually beneficial process in which all win, or in default of which all lose.

The overall health and vitality of the developing world is central to the well-being of the economically developed nations, Canada among them.

That is one reason why IDRC pays the attention it does to the strengthening within the developing countries of indigenous



scientific competence. The Centre continues to emphasize, as it has since its inception, agricultural research, the health sciences, improved communication and exchange of information, and a better understanding of the social dimension of development. In addition, increasing emphasis is devoted to the Centre's fledgling Cooperative Program, designed in response to the request of the developing countries to permit collaborative scientific endeavours between them and Canadian research institutions. A report on the first full year of activity of this new program is to be found on page 33 of this booklet.

As the Centre moves into its second decade, it is endeavouring to acquaint decision-makers within the developing countries of the wealth of scientific and technological knowledge that is now available for broad application and utilization. A good deal of this knowledge is the product of actual field research undertaken with the support of IDRC. Its practicality and its applicability under local conditions have already been proved. It now needs the support of government to be implemented for advantage.

The wise men who formulated the Centre's charter anticipated this generation of activity. IDRC is called upon by its statute not only to conduct research into "the problems of the developing regions," but also into "the means for applying and adapting" that knowledge. In discharging its

mandate, the Centre attempts always to be practical. Practicality is a criterion employed in the assessment of proposals for research funding. Practicality demands as well that positive research results be applied for the benefit of the people of the developing countries and not left on an institutional shelf, there to gather either honour or dust. Human dignity is ill-served by stagnant knowledge.

Ivan L. Head  
President, IDRC

## Back to Basics

Food, energy, and water are three of humanity's most basic requirements. Yet simply acquiring enough of these occupies perhaps one-third of the world's people, all day, every day. To fail to do so is to fail to survive.

These are the poorest of the poor in the vast rural areas of the developing world: the small farmers with just a hectare or two of land, the landless labourers, the hundreds of thousands of refugees fleeing from war and deprivation. Those who fail in the daily search will be that much weaker tomorrow, that much more likely to fail again. The ultimate penalty for failure is death, from starvation, or more likely, from malnutrition and disease.

The facts speak for themselves. About 500 million people are suffering from serious malnutrition. About one billion people have no safe water or adequate sanitation facilities. About 100 million people live in areas where there is an acute shortage of fuel of any kind for cooking and heating. But, in spite of gloomy statistics like these, 1981 presented some cause for optimism, however fragile.

**Item: Food** — 1981 has been a bumper crop year, notwithstanding another poor harvest in the Soviet Union. The benefits of agricultural research and development are making themselves felt in some developing countries. For example, five years ago, India imported U.S. \$1.67 billion of grain. Last year, India exported \$2.7 billion of rice and other food items, and was actually in a position to offer food loans to neighbouring countries.

The World Bank's 1981 Development Report advises that per capita food consumption worldwide now exceeds the minimum requirement by eight percent. The same report adds, however, that in 52 of 127 countries for which statistics are available, per capita food consumption was below the minimum. In other words, there is enough food for everyone, but not everyone is getting enough.

IDRC's agriculture, food and nutrition sciences staff, while striving to find every



**Flourishing rice fields in Sri Lanka: a bumper crop year for some nations.**

means to increase food production, have long been aware that merely producing more food is not of itself sufficient to overcome the problem of world hunger. Hence the continued and growing emphasis on support for research projects in the postproduction field. A systems approach to research on the handling of food, from harvest to consumption, helps to reduce the



government funding for research on the energy needs of developing countries, the funding to be provided over four years. Although the Centre already funds many energy-related projects (some of which are reported elsewhere in this review), the additional grant will permit the development of a coordinated program for research in this vital field that reaches across the divisional boundaries within the Centre.

One of the program's first steps will be to help the developing countries identify their own research needs in the energy field. A research review and advisory group will be formed to advise both national governments and donors on areas where research is needed. This is a technique the Centre has used successfully in the past in other fields.



**Experimental solar energy equipment at Egypt's National Research Centre: identifying needs.**

present unacceptably high levels of waste. It also ensures that the food gets where it is needed, when it is needed.

**Item: Energy** — A positive move was the commitment by Canada's Prime Minister, Pierre Trudeau, at the Nairobi UN Conference on New and Renewable Sources of Energy to make available \$10 million in

**Item: Water** — The year 1981 marked the beginning of the International Drinking Water Supply and Sanitation Decade. The Decade's targets are ambitious: water and sanitation for an additional half billion people by 1990, technical and professional training for a million workers, and commitments by the developing countries and the

donor agencies to continue efforts to eradicate water and sanitation problems entirely by the end of the century.

Only time will tell how well this immense undertaking succeeds, but already there are signs of progress in many countries. IDRC's health sciences program has been active in this field for many years, and continues to press the importance of social and economic aspects of water and sanitation programs, while at the same time providing valuable support for technological research and development. Because of its sensitive and complex nature, this is a field that also involves the Centre's social sciences, information sciences, and communications programs.

To say that these basic problems facing



**Water and sanitation for half-a-billion people by 1990: ambitious target.**

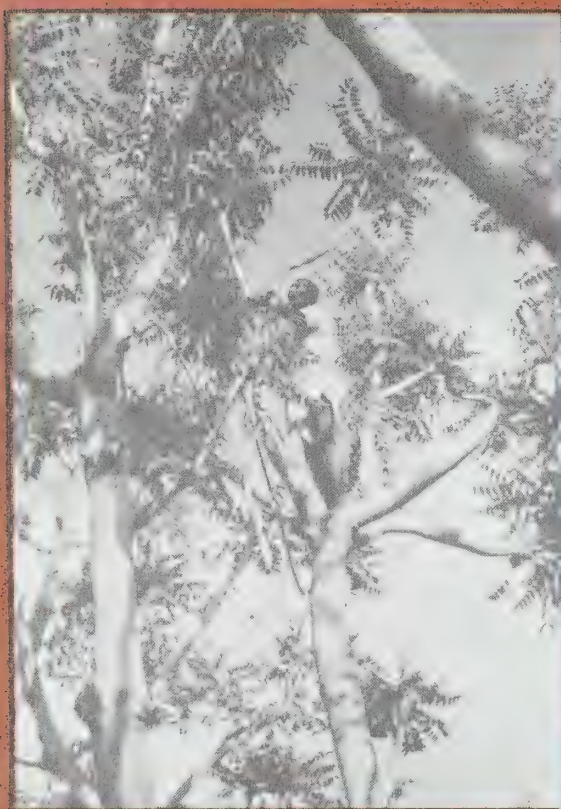
the Third World are almost overcome is both misleading and cruel. Yet, in the face of statistics that are often so immense as to be almost incomprehensible, it is often easy to be overwhelmed, to assume that these problems are simply too large to be resolved.

Such an attitude denies the very real

progress that has been made. Even in the low-income countries, the average life expectancy has increased from 37 to 51 years over the past 30 years; adult literacy has increased from 22 to 39 percent of the population; economic growth rates have increased from 0.6 to 1.7 percent; and GNP per person (in 1980 dollars) has increased from \$170 to \$250. The struggle is a long, uphill one, but progress is being made. And now, more than ever, it is vital that we do not allow ourselves to slip back, to lose the ground that has been gained.

IDRC's contribution to this uphill journey is modest, yet nonetheless significant. Applied research provides the essential footholds that enable societies to obtain firm footing, and to make progress, step by step. The following pages present a brief review of some of the projects now being carried out by Third World scientists that make up the current research programs of the International Development Research Centre.







## Agriculture, Food and Nutrition Sciences Program

Since its inception, the Agriculture, Food and Nutrition Sciences Division has directed virtually all its resources to the encouragement and support of applied research for the benefit of rural peoples, who constitute the vast majority of the populations of the Third World nations. Operationally, it is the largest of the Centre's program divisions, accounting for approximately 39 percent of the total project budget. In 1981, the division initiated 51 new projects, totaling some \$12.1 million.

Because they are the areas that suffer the greatest constraints to increased agricultural production, the semi-arid regions of the developing world are the principal focus of much of the division's research support. The emphasis is on research to improve production and processing of traditional crops, such as sorghum, millets, grain legumes, oilseeds, and root crops, that are staples for hundreds of millions of people and yet have received relatively little attention from agricultural researchers until recently.

The division supports specific research programs in international and regional research centres, and endeavours to forge cooperative links between these and projects carried out by national institutions. IDRC is a founding member of the Consultative Group on International Agricultural Research (CGIAR), and supports selected programs within the CGIAR's family of research centres.

The division's program of work is divided by discipline into five sectors:

- Crop sciences, especially crops of the semi-arid tropics, and multiple cropping systems;
- Fisheries, including aquaculture and mariculture, development of artisanal fisheries, coastal ecosystem management, study of fish diseases, and utilization of neglected species;
- Animal sciences, with emphasis on live-stock management and disease, pasture improvement, by-product utilization, and the study of animals in integrated farming systems;

- Forestry, particularly social forestry, afforestation and savanna forestry, tree improvement, forest-products utilization, and integrated forestry systems;
- Postproduction systems, including agro-industrial development, operations research, and study of consumers' nutritional needs and attitudes to food quality.

A complete review of the division's first 10 years of activity is to be found in the recent IDRC publication, "A Decade of Learning" (see page 35).

The director of the Agriculture, Food and Nutrition Sciences Division is Joseph H. Hulse, who has held the position since joining the Centre in 1970.

**The Year in Brief** — In the semi-arid tropics, hardy drought-resistant grains, such as sorghum and the millets, and protein-rich grain legumes are the staple diet of most rural peoples. Research to improve these crops is a high priority.

In Zimbabwe, little research has been done in the past to assist the country's four million small farmers. A new project here will help a team of young researchers establish a plant-breeding program for sorghum and pearl millet to improve small-scale grain production. In Bangladesh, where the minor millets could provide an important winter crop, as well as insurance against drought, researchers are attempting to increase the use of millets in rice-based agriculture.





**Alpaca and friend in Peru: high potential.**

Another research team in Bangladesh recently completed the first phase of a project to upgrade local legume varieties and, in a second phase, is testing the results under farm conditions. Lentils and chick-peas,

staples throughout the Middle East, are the subject of a similar project in Jordan; and, in Egypt, two ongoing projects dealing with different aspects of legume research entered second phases during the year.

Egypt is also attempting to increase its food production through development of farming systems suitable for desert soils. The division has considerable experience in the support of farming systems research, experience that will benefit the Egyptian project. Networks of similar Centre-supported research operate in Asia and Latin America, where several cropping systems projects that have shown early promise are continuing with second-phase activity.

In the Andean highlands of Peru, the division's animal sciences program is supporting a project to introduce forage plants that will thrive at these altitudes, thus enabling local farmers to increase cattle production. Another project in this region is aimed at more fully exploiting the potential of the llama and the alpaca, native animals that, because they live at altitudes beyond the range of most livestock or crops, offer great economic promise for poor mountain farmers.

Improving on-farm technologies is an important part of the division's postproduction systems program. Grants were approved during the past year for projects in Panama and Peru to develop appropriate technologies for processing important regional crops such as bananas, plantains, and potatoes. In Thailand, a project to develop a solar dryer moved into a second phase, while another, aimed at developing a low-cost passive cooling system for storing fresh vegetables, has recently begun. And, in Zambia, researchers are working on a low-cost system for drying vegetables for long-term storage.

Several projects to develop improved rice-handling technologies moved into second- or third-phase activity during the year. In the Philippines, researchers are developing commercial-scale and village-scale mills. In Korea and Ghana, however, the emphasis is on small-scale, manually operated, portable threshers for field use.

If a crop is to win consumer confidence, it must be presented in acceptable form. In Tanzania, researchers are hoping to

increase the use of sorghum as a dryland crop by developing sorghum-based flours and baked goods that will have popular appeal. In Ethiopia, a similar project is developing modern techniques for the production of traditional foods, as well as sorghum-based baby foods.

Processing and preservation of fish present very different problems, some of which were ingeniously solved in the first two phases of a Centre-supported project in the Philippines. Researchers developed a low-cost fish dryer fuelled by rice hulls. This will be field tested in phase three, as will improved techniques for handling, packaging, and storing dried fish.

The division's fisheries program is placing increasing emphasis on research in Latin



**Bagging sorghum-based baby food at the Ethiopia Nutrition Institute: new uses.**

America, drawing on the extensive experience acquired in Asia over the past 10 years. Wild fish in the Brazilian Amazon will be studied for their aquacultural potential in an ambitious new project. And, in the Dominican Republic, researchers are developing fish-culture systems that can be used in lakes, canals, and other waterways to

provide a cheap source of protein for rural peoples.

Aquaculture includes plants and other aquatic life forms as well as fish. In Chile, researchers are working with coastal villagers to develop some of these less-traditional sea products, such as molluscs and edible seaweeds. By providing additional income



for people who derive their livelihood from fishing, the project should help reduce the risk of overfishing.

One of the main concerns of the division's forestry program is "social forestry," which is dealt with in more detail later in this chapter. The program also continues to support the International Council for Research in Agroforestry (ICRAF), which it helped to establish in 1977, as well as several integrated-forestry projects that use combinations of trees, crops, and animals in a systematic way to increase production from the land.

Although it is in fact a grass, not a tree, bamboo is also a concern of the forestry program. This versatile plant is used for everything from food to furniture



**Fishermen's tales in Brazil:** increasing emphasis on fisheries in Latin America.

throughout much of the tropics, yet little research on it has been undertaken until recently. The program now supports several bamboo research projects, forming a small but growing network that recognizes the economic importance of this plant.

## Wood for Fuel — Restoring the Balance

In Nairobi, this past August, a thousand people of many nationalities marched in a solemn procession, bearing armloads of firewood to the steps of the UN Conference on New and Renewable Sources of Energy. Their aim was to dramatize the phenomenon that has been called "the hidden energy crisis": the fact that the Third World is fast running out of fuelwood.

A few statistics illustrate the proportions of that crisis. One-third of the world's population, about 1.5 billion people — virtually all of them living in the developing countries — depend on fuelwood for cooking and



**Young charcoal seller in Tanzania:** the Third World is running out of fuel.

heating. Of all the wood cut in the developing countries, 90 percent is for fuel. The total forest area destroyed each year is roughly equivalent to the land area of Great Britain. At that rate, the world's forests will be halved by the year 2000 — in less than 20 years.

The side effects of such massive deforestation include soil erosion, destruction of



farmland, desertification, climatic changes, and, inevitably, increased pressure on the remaining forested areas. There are no easy or instant solutions. Alternative fuels or energy sources are either not yet available, or too expensive. It does little good to tell people not to cut trees when there is no affordable alternative and they are already down to one cooked meal per day.

Early in its existence, IDRC recognized the firewood crisis and, from the beginning, the forestry program has placed a great deal of emphasis on what is called social or community forestry. The objective is to develop simple techniques for the production of fuel, fodder, and small timber to meet the basic daily needs of rural people. Social forestry continues to be the main thrust of a

this and similar projects is community involvement. A village woodlot or a shelter-belt will have no chance unless the villagers understand its purpose, and accept some responsibility for it. To achieve this, the research must have a sociological component aimed at identifying the villagers' perceptions of their needs, and reinforcing support for rural forestry development programs.

The project is now in its second phase and, during the next three years, it will concentrate on passing on the knowledge gained in phase one — teaching basic forestry techniques to the villagers for the production and protection of fast-growing trees. The project is being closely observed by several donor agencies, including the World



Dead forest in the Sahel: no instant solutions.

program that is expected to expand rapidly in the next five years as part of a Centre-wide emphasis on research for renewable energy.

The greatest concentration of Centre-supported forestry research has been in the Sahelian region of Africa. One of the most successful projects there has been the village woodlots project in Niger. The key to

Bank, which is interested in large-scale replication of the project in the region if its early promise is fulfilled.

In Egypt, forestry researchers are striving to develop improved species of casuarina, a hardy tree that grows well in arid climates. The tree has great potential for use in shelterbelts to aid reclamation of farmland. It can also be a good source of useful timber



and, as a bonus, it has the ability to extract nitrogen from the air in the soil and fix it in its roots, effectively providing its own nitrogen fertilizer.

This project, too, has just started second-phase research. Building on the breeding program that was developed in phase one, the researchers are testing four fast-growing species in field trials under a variety of conditions. They are also studying the tree's reproductive characteristics and its nitrogen-fixing capability. This phase of the project will also see the establishment of a seed bank and of a training program for extension officers involved in afforestation work with farmers.

The results of the Egyptian project will have wide application in other arid regions, as will those from another project of the forestry program, in Peru. This ambitious project, now in its second phase, is developing afforestation techniques in the Peruvian highlands with the purpose of strengthening the economies of depressed regions through a combination of forest plantations and pastoral farming.

Some 39 species of eucalyptus and conifer were tested in phase one, and the most suitable species are being fully evaluated in phase two, which includes technical and economic feasibility studies. The project has also been broadened to include studies of fodder trees, such as *prosopis*, to reclaim unproductive arid land. Trial plantations will

be irrigated with waste water pumped by windmills.

As part of a new strategy for forestry development, India is establishing large-scale community forestry programs in several states. If the strategy is to succeed there is an urgent need to identify compatible tree-grass-legume combinations to increase the productivity of degraded farm and wastelands (at present, only about half of India's land area is cultivated).

This new four-year project should also have application in many other areas of the developing world that face land degradation as a result of increasing population pressures. Its objectives are to improve the land to the point where it can produce not only fuelwood, but fodder, small timber, and minor forest products for the rural people.

## Health Sciences Program

Most of the projects supported by the Health Sciences Division are concerned with the health problems of people in the rural areas, because these regions of the Third World have the greatest need. Doctors and hospitals are rare outside the cities and, in many rural areas, there are no medical services of any kind.

Because of the enormous scale of the problem areas, the division makes every effort to use its project funds so that they may work as a catalyst, providing maximum impact and stimulating local research capacity. The division maintains worldwide links with other international agencies to ensure that its research results are shared, and it participates in major international research efforts such as the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases, and the work of the International Committee on Contraceptive Research.

The rapid growth of industrialization and urbanization in many developing countries has led to an increase in health problems previously more common in the developed world, and in turn has led to some shift in emphasis in certain areas of the division's program. There is also a special concern for the health of rural-urban migrants living in squatter settlements around major towns and cities, often without access to even the most basic of facilities.

About 14 percent of the Centre's project budget is appropriated by the Health Sciences Division. During the past year, the division initiated 37 new projects with grants totaling \$4.4 million.

The program focuses on five main areas of research:

- Fertility regulation, stressing the need for better and safer contraceptive methods, studies of possible side effects of existing methods, and studies in maternal and child health care;
- Basic health services, including studies of rural health-care needs, training and personnel requirements, middle-level health-care management, health economics, and the development of new therapeutic methods;

- Tropical diseases, including diseases related to malnutrition, diarrheal diseases, and research at the national and international level seeking biological and environmental control of endemic tropical diseases;
- Rural water supply and sanitation, with emphasis on management and social aspects, waste reclamation, as well as the development and evaluation of appropriate water and sanitation technologies;
- Occupational health, investigating specific work conditions and work-related health problems in the fast-growing industrial sector, as well as the use of modern technologies in agricultural production.

The director of the Health Sciences Division, Dr John Gill, has held that position since 1975.

**The Year in Brief** — The 1980s have been designated as the International Drinking Water Supply and Sanitation Decade in recognition of the importance of these two factors in improving health. The division has been encouraging research in this field for several years, and is concerned with the sociological aspects of water supply and sanitation, as well as with the implementation and evaluation of simple, inexpensive technologies.

In Ecuador, researchers are studying sand filters that can provide potable water at low cost and, in Thailand, another new Centre-supported project is developing



catchment and storage systems for rain-water. In Ethiopia, researchers are studying the socioeconomic and cultural factors involved in water supply to develop more effective installation programs. Also in Africa, an attempt is being made to help combat the present scarcity of trained personnel in the water and sanitation fields through national and regional training workshops.

Public acceptance is essential to the success of sanitation programs. Thus, in the Philippines, the division is supporting a survey of people's attitudes and behaviour to find out why new toilet facilities in a community may or may not be used. In Chile, a new project is examining the impact of improved housing and sanitary conditions on



**Water supply in Ethiopia: finding the right pump is only part of the solution.**

diarrheal diseases in adults and children, which are major causes of morbidity and mortality. The division also supports the World Health Organization's global program for the control of diarrheal diseases.

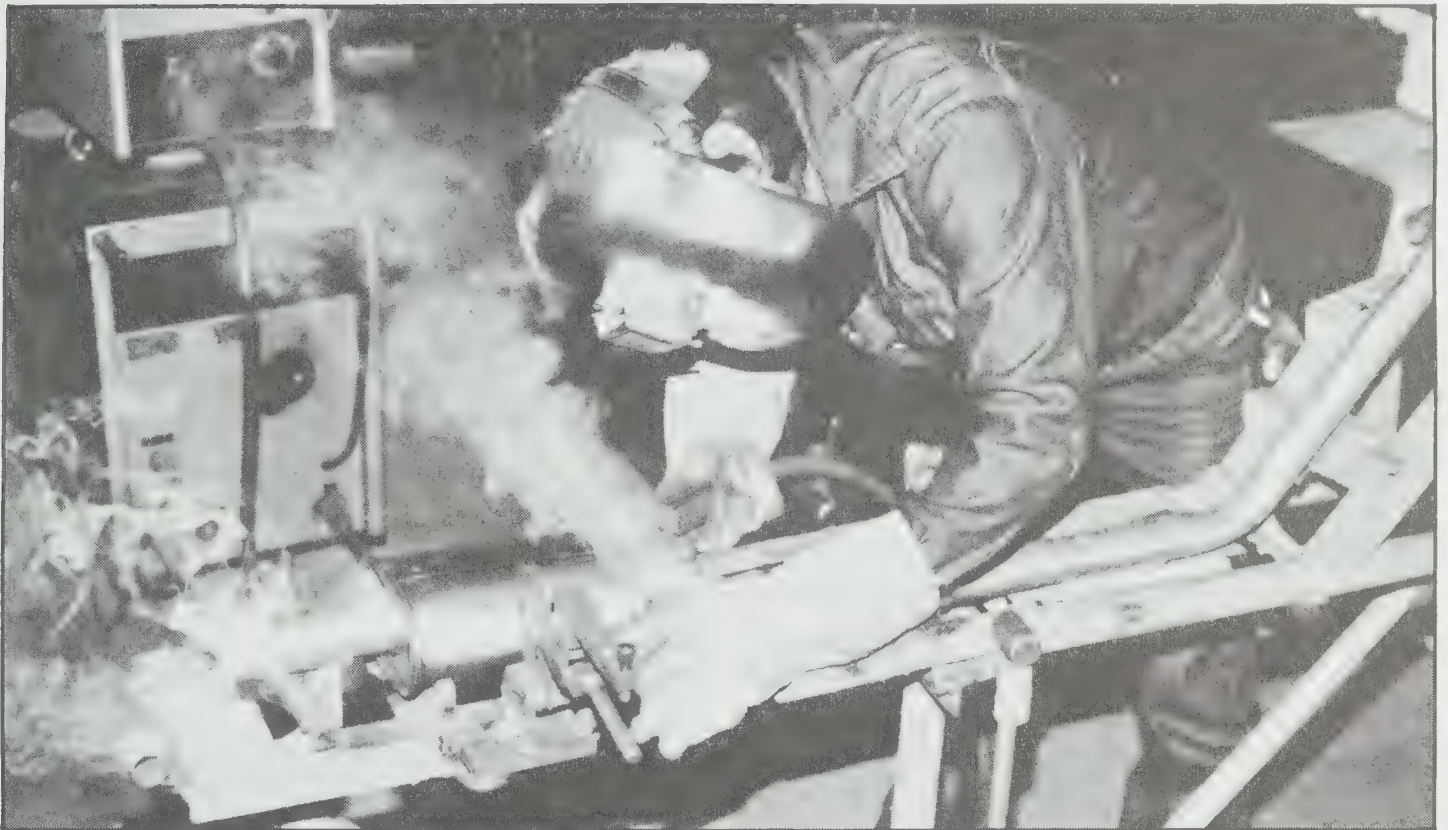
Another global effort to which the division contributes is the UN Special Programme for Research and Training in Tropical Diseases. A number of serious ailments are not covered by this program, however, such as Chagas' disease, dengue hemorrhagic fever, and a number of sexually transmitted diseases. These are the subject of separate research projects supported by the division in Latin America, Asia, and Africa. The division's first venture into China involves a special training program in epidemiology through Canadian institutions for some 30 key Chinese health scientists.

Community health services are important in the control of disease. Two projects in the Philippines are part of the division's program to improve rural health-care delivery. One is concerned with extending and upgrading the skills of village midwives, while another aims to design an improved, simplified record-keeping system for village health volunteers. Another new project in Sumatra is developing a disease-reporting system for use at the district health-centre level.

Two projects are testing simple aids to combat two of the principal causes of child deaths in the developing world. A time-temperature indicator to reveal impotent vaccines could be particularly valuable to health workers in remote areas. Its development is described in more detail elsewhere in this chapter. Another project is designing and testing simple instructional materials to

who are thought to be at greatest risk.

Family planning plays an important part in child health, because it allows the mother a reasonable spacing between births. The division's program of research for fertility regulation is supporting a project to devise effective information packages to accompany the introduction of new contraceptive implants in Ecuador, Indonesia, and Thailand. A related project will train medical staff in the use of the implant method. In Chile, research is continuing in the second phase of a project to determine the feasibility of developing antibodies to interfere with the male fertilization process. In Canada, the division is supporting research studying a possible link between vasectomy and arteriosclerosis, or coronary artery disease.



**Small-scale industry in the Philippines:**  
occupational health problems on the increase.

promote the use of a simple, inexpensive oral rehydration technique to combat dehydration resulting from diarrhea. The project involves four Southeast Asian countries.

In Sudan, a new project will follow up work by Sudanese researchers on mycotoxins — naturally occurring fungal toxins such as moulds that appear on food and can result in serious illness if eaten. The researchers are particularly concerned about the effects on malnourished children,

Several new projects have begun in the field of occupational health. In Sudan, researchers are studying the prevalence of silicosis among chromite miners and will make recommendations for improved working conditions in the mines. And, in Singapore, researchers are undertaking a review of occupational health conditions in several Asian countries where rapid industrialization has led to an increase in work-related health problems.



immunocompetence — the body's ability to build defence mechanisms against infection. Thus the malnourished child is doubly at risk: more likely to become ill, and more likely to develop complications. Most of the research to date has focused on severely malnourished children but some recent data suggest that moderate, or even mild, malnutrition also reduces the effectiveness of immunization.

In Colombia, IDRC is supporting a study of 360 children that will provide detailed information on the effectiveness of immunization over a 21-month period. The children are divided into three groups according to "nutritional status," which is measured by means of a simple device developed in an earlier IDRC-funded project. Each child

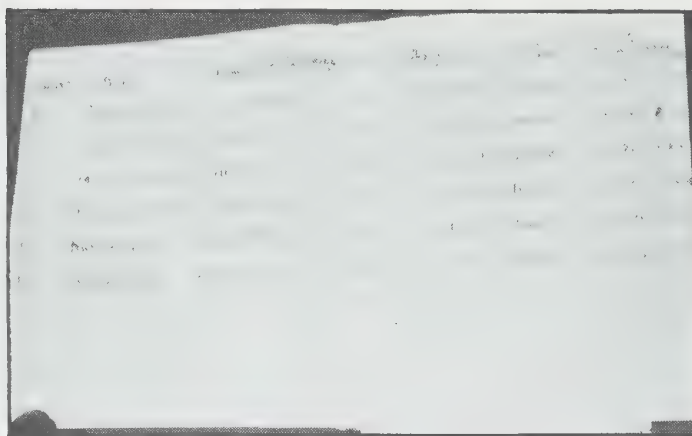
## Taming the Measles

Only a generation ago, diseases such as measles, diphtheria, whooping cough, and polio were a common childhood threat worldwide. In the industrialized nations, the threat has gone as a result of mass immunization programs that have made large-scale outbreaks of such diseases a rarity.

In the developing world, however, these childhood diseases are still prevalent and a simple case of measles can become fatally complicated if the victim is already weakened by poor diet or intestinal parasites. In fact, measles is a major killer of children under five years old in many countries.

Under the leadership of the World Health Organization's Expanded Programme for Immunization (WHO/EPI), protection against childhood diseases is rapidly being made available in developing countries. Immunization campaigns are an accepted part of public health programs as parents come to understand the importance of this simple procedure. Acceptance, however, is largely dependent on success and here the WHO/EPI has been running into problems, because the results, in terms of prevention of disease, have been disappointing.

There are several probable reasons for the unexpectedly high failure rates in immunization campaigns in developing countries. One has to do with malnutrition. It is known that there is a link between malnutrition and



**Village death register in Bangladesh: measles is a major child-killer.**

receives an identical immunization schedule, and is regularly tested to determine antibody levels and continued nutritional status. Routine home visits will also give a more detailed picture of each child's household environment.

If the project confirms a relationship between moderate levels of malnutrition and immune response, the implications for the planning and timing of mass immunization campaigns are considerable.

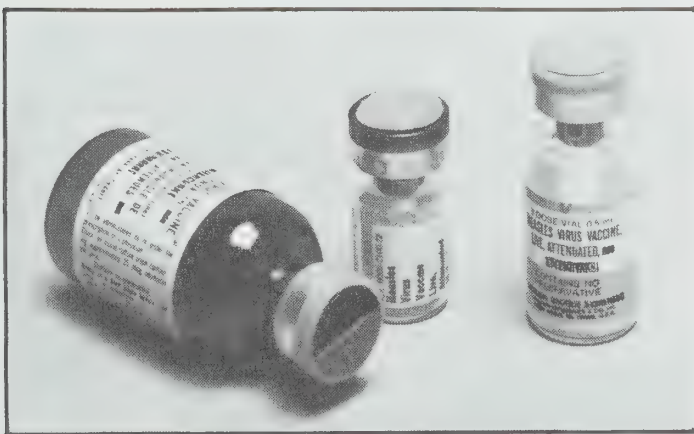
Another probable cause of failure is the fragility of the vaccine itself. Live vaccines, such as freeze-dried measles, deteriorate quickly when exposed to high temperatures or light. Avoiding these conditions, particularly in rural areas of the tropics, is often difficult. As a WHO/EPI report explains, the biggest practical problem is simply that of keeping vaccines safe and effective, through refrigeration, "from manufacture to child."

What makes the problem even greater is that a live vaccine looks just the same as a "dead" one — there is no way for the health worker to know if the vaccine is good or not. Thus, according to one estimate, 10 million children each year receive inactive vaccines. The result is a large waste of time and money, and, perhaps more damaging, loss of public confidence.

This situation could soon change thanks to the development of a simple time-temperature indicator, a telltale coloured sticker that can be attached to the vaccine vial, and changes from red to brown to black as the vial is exposed to adverse conditions. The prototype was produced by an American company that subsequently dropped the project because it saw no chance of



**A case of measles: the management indicator tells the whole story.**



**Vaccine vials with indicators: you can see the difference.**

sufficient profit return. The technology is now being developed by the Program for Applied Technology for Health (PATH). IDRC is one of the major donors to this project.

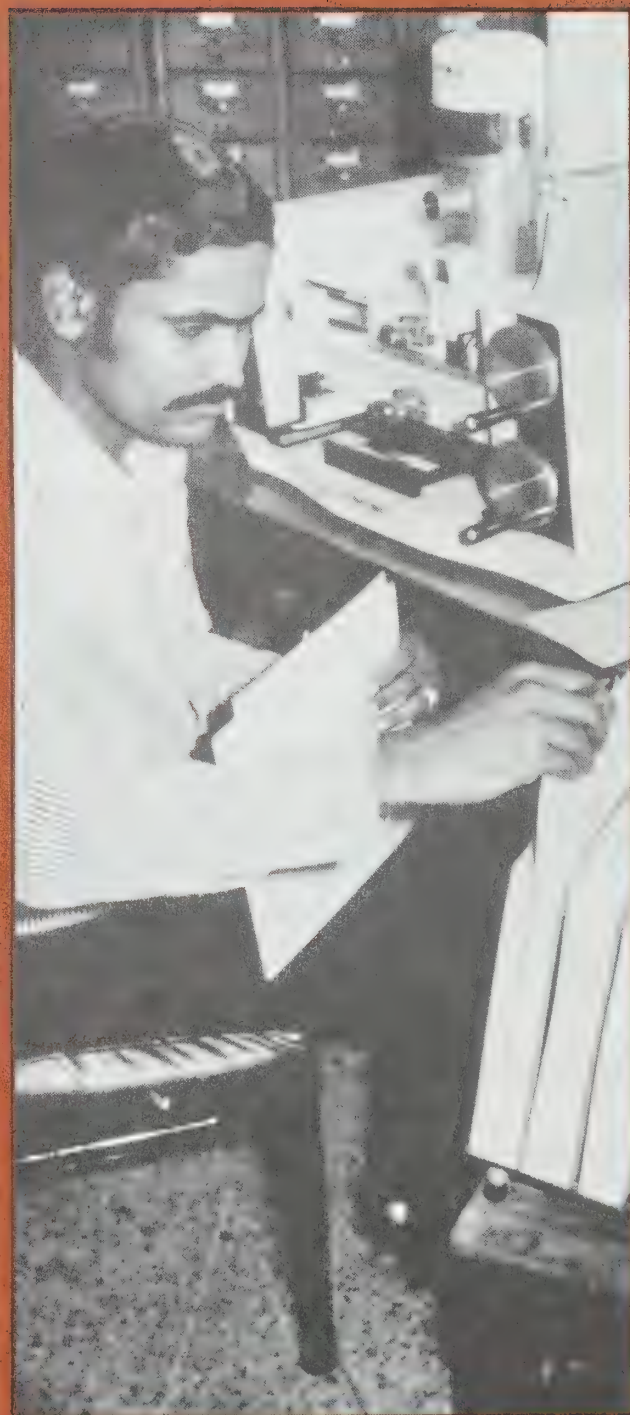
In the first phase, the researchers extensively tested the indicators and developed

techniques for pre-aging them to match the WHO maximum standard for measles vaccine of seven days at 37°C exposure. The work is being carried out in close collaboration with WHO/EPI. Toxicity studies were also undertaken to ensure that the chemical used on the indicators is safe in everyday use and a coating technique was developed that is protective but does not alter the indicator's performance.

The second phase of the project, begun late in 1981, should complete the necessary steps to mass-produce the indicators. This will involve development of a printing technology using the chemical indicator, a "management indicator" to go on the containers in which vaccines are packed, information and support materials for health workers, and extensive field testing and evaluation by 300 health workers in Mexico, Indonesia, and the Philippines. Liaison with vaccine manufacturers has been part of the project since the beginning, to ensure that the necessary machinery will be in place for mass application of indicators on individual vials and on shipping cartons. Both the Armand-Frappier Institute, in Quebec, and the Connaught Laboratories, in Toronto, are involved in this phase.

Barring unexpected setbacks, the indicator should be ready for mass production by the end of 1982. In future, health workers will be able to see at a glance if their vaccines are still effective.





## Information Sciences Program

Reflecting the rapidly advancing information technology that is becoming a major force in shaping global society, the Centre's Information Sciences Division is also changing. While developing new initiatives in several areas, however, the main thrust of the division's program continues to be devoted to the promotion of cooperation among nations in the collection and dissemination of recorded knowledge, thus avoiding duplication of effort and a waste of scarce human and material resources. In its support for information projects in such fields as agriculture, health, population,



**Microfiche collection at Tunisian documentation centre: more accessible information.**

education, and economic planning, the division is closely involved with the work of the Centre's other three program divisions. Its activities frequently add a further dimension to their research programs, and in this way reinforce them.

During 1981, the Information Sciences Division received grant approvals for some

25 new projects (in addition to those projects managed in-Centre as continuing activities), with grants totaling \$4.3 million. This represents 14 percent of the Centre's project budget.



The main emphases of the Information Sciences program are:

- Support for international cooperative information systems, either global or regional, with particular emphasis on assisting developing countries to participate in, contribute to, and benefit from such systems;
- Support for specialized information analysis centres dealing with narrowly defined topics of importance to international development;
- Library development, and the operation of IDRC's own library and information services;
- Extension services, especially for small-scale or rural-oriented industries in developing countries;
- Cartography, particularly the use of data obtained from satellites to produce thematic maps;
- Computer science, particularly the application of data-base management systems to the storage and retrieval of information in developing countries;
- Promotion of compatible information-processing methods so that information can readily be shared among institutions in different parts of the world;
- The application of improved telecommunications to rapid information exchange among developing countries.

The Director of the division since its inception has been John E. Woolston.

**The Year in Brief** — The program of the Information Sciences Division differs from those of the other divisions in that, in addition to supporting information activities proposed by developing-country institutions and carried out by them, it also funds and manages a number of in-Centre projects, such as the IDRC library, which continues to serve the needs of Centre staff and the Canadian development community at large. The data base of the library's holdings and several other bibliographic data bases are mounted on the Centre's minicomputer. After a successful pilot project of demonstration and training, these data bases are now available for interrogation from remote terminals across the country as a continuing service. Some of the data bases have been obtained from international agencies with interests similar to IDRC's; others have been developed by in-Centre projects, such as SALUS, a bibliography with abstracts on low-cost rural health care delivery. The machine-readable data base from this project is now backed by a file of microfiches of the documents that were summarized for inclusion in the bibliography, and copies of the microfiche file have been distributed to several developing-country institutions where they will be more accessible to users.

MINISIS, the computer software system developed by the division for managing such data bases, has been significantly enhanced, and continues to attract new users in developing and developed countries. Close to 40 organizations are now using MINISIS under licence from IDRC, including ILO (the International Labour Office), the organization that developed the original ISIS system.

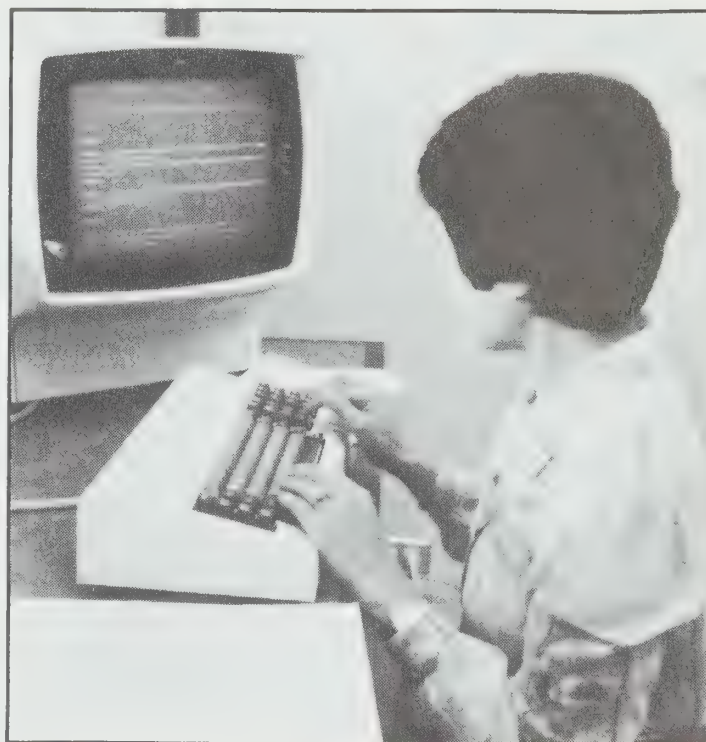
The success of MINISIS has meant that division staff have spent a good deal of time presenting training courses, not only in Ottawa but also around the world. This illustrates another aspect of the information sciences program: it is continually responding to requests not for funds but for professional advice in the design of new systems and services, or the development of information tools such as multilingual thesauri, and for software. In many such cases, a grant or a consultancy will not fill the need. Often the division's own professional staff

are the ones most sought after to provide that professional help; often, as in the example of MINISIS, few people outside IDRC have enough experience or knowledge or are available to provide direct advice and assistance to developing-country institutions.

In terms of more conventional project activity, one of the division's larger programs continues to be support for international cooperative information systems, which provide a framework for the sharing of information among countries and for the optimum use of scarce information resources.

In the field of socioeconomic information, renewed grants were approved for two related regional networks begun with Centre support to serve ministries of planning and similar bodies in the framework of the Development Sciences Information System (DEVSIS). INFOPLAN, based at the UN Economic Commission for Latin America, in Chile, and CARISPLAN, the subregional network based at the Caribbean Documentation Centre in Trinidad, will both be consolidated during second-phase activity, and will enlist the participation of as many countries as possible in their regions. All of the principal institutions participating in DEVSIS-type activities intended to collect and organize the information needed for socioeconomic planning were brought together at a meeting in Ottawa. At this meeting, common methodologies were worked out and agreed upon so that, in the future, it will be possible for these institutions to exchange records in machine-readable form and to interrogate each other's files with maximum ease.

In the past year, the division has continued its support for AGRIS, the global agricultural information system coordinated by the Food and Agriculture Organization of the United Nations, by helping to apply a multilingual thesaurus to the system and to train user institutions in its application. This controlled vocabulary of indexing terms, known as AGROVOC, enables AGRIS participants to describe, or index, their agricultural documents by subject in more detail and to retrieve documents with greater precision. During the past year, another project has been approved not only



**The Agricultural Information Bank for Asia: part of the global AGRIS network.**

to continue this work, but also to shift the emphasis of the IDRC support to the production of microthesauri to meet the needs of specialized agricultural information analysis centres. Support for these centres, another major area of project activity for the division, has been studied in depth this year by the Centre's Office of Planning and Evaluation. It is described in more detail later in this chapter.

The division also supports participation in AGRIS through projects at the national and



regional levels. A number of new projects are underway in Latin America and the Caribbean — in Costa Rica, Chile, the Dominican Republic, and Jamaica — aimed at helping countries better contribute to and benefit from AGRINTER, the regional agricultural information network that the division helped to establish, which is now using an IDRC grant to make agricultural documents available in the form of microfiche. The division supports a similar regional project in Southeast Asia, where it approved a second grant to the Thai national participating centre. National agricultural information projects were also approved for Sri Lanka and for Egypt, which will enable those countries to keep track of the agricultural literature they produce.

At the International Council for Research in Agroforestry (ICRAF), based in Kenya, a novel approach is being tried to provide an information service in this diffuse field of agricultural activity. Instead of collecting literature in anticipation of demand as is done in many crop-specific information centres, ICRAF will draw upon sources of information around the world to meet the requests of its own scientists and the scientists engaged in research projects coordinated by ICRAF. In this way, a specialized file of requests, sources drawn upon, and responses given will be accumulated as the basic resource for the future service. Another unusual information

service is operated in Ivory Coast by the African Institute for Economic and Social Development (INADES). This uses bibliographies, photocopies, and travelling "book boxes" to serve amateurs in remote rural areas. In a second phase, several branch collections of documents on microfiche, together with microfiche readers, are being set up to complement the present service and to place the basic resource material closer to the users.

In the field of cartography, the division has for some years supported a series of projects that are helping developing countries to make use of data collected by remote-sensing satellites. Although the satellites themselves are expensive, the data collected by those already in orbit can be used by developing countries for production of maps that would be too expensive to produce by conventional ground surveys. The most recent grant, to the Regional Remote Sensing Centre (CRTO) in Ouagadougou, Upper Volta, will assist in the training of African research workers in natural resource studies, and in the development of appropriate applications for remote-sensing technology.

In the past few years, satellites have contributed to tremendous advances in telecommunications technology, one of the results of which has been to make telecommunications costs far less dependent upon distance than in the past. This has enabled novel forms of information exchange to be devised, which could be developed to the benefit or to the detriment of the Third World. One of these, computer-based message systems or computer conferencing, was the subject of a meeting called by IDRC to consider how developing countries might take advantage of this technology. It is likely to be followed by projects studying the technology in action.

## Putting Information to Work

What do cassava, water buffalo, and ferrocement have in common? Just one thing: they are all important subjects of research for which specialized information analysis centres have been established to serve scientists of the Third World.

Access to information is often crucial to the success of a research project. It is essential not only to enable scientists to carry out their work and to keep abreast of latest developments, but also to help them avoid duplication of effort and waste of time. Two groups of researchers may be working on related projects in different countries, or even in different parts of the same country. Each may be able to contribute to the



**Water buffalo: important enough to have their own information centre.**

other's work, but only if they are aware of what is happening elsewhere.

Developed-country scientists, who already have access to large libraries and highly sophisticated information systems, keep in touch with each other through a complex network of communication — the so-called invisible college, which includes publications, visits, conferences, telephone calls, and letters to the editors of prestigious journals. But developing-country scientists, with limited foreign exchange and few contacts, are at a disadvantage in trying to join this

college. The international cooperative information systems are intended to redress this imbalance. The prime example is probably AGRIS, the FAO's system for the agricultural sciences.

For the developing-country scientist engaged in a new research project, lists of documents that may be relevant, but are also costly and time-consuming to acquire and read, are only a partial solution to the information problem. Very often what is needed is something a good deal more sophisticated; a centre that can interact with



the research team and actually play a part in the problem-solving process; a specialized information analysis centre that can not only evaluate information and save a vast amount of literature searching and reading by individuals, but one that can also act as a communication mechanism to make the invisible college more visible and to enable developing-country scientists to join it.

By bringing scientists into contact, the specialized information analysis centre can thus bring about a "cross-fertilization" of ideas, so that all groups make greater progress than would have been the case if they had continued to work in isolation. A system such as AGRIS, which handles tens of thousands of documents every year, could not possibly operate in such a fashion.

When a researcher contacts a specialized centre, it is not usually just to request a specific document. The enquiry is more likely to be: "here is my problem; what can you tell me that will help me solve it?" To provide this level of service, the librarians and documentalists who staff such centres should ideally themselves be authorities on their subject matter, and they must work closely with the scientists.

Fernando Monge, the Information Sciences Division's representative in Latin America, says scientific information and communications services should never be divorced from the research process. On the contrary, he says, they should be used as a means of interconnecting the elements of the scientific research system "to make it work as a system, and not as a heap of unconnected and disorganized parts."

Dr Monge is an information scientist who also holds degrees in agriculture and plant genetics. He speaks from experience, having helped establish one of the earliest specialized information analysis centres supported by IDRC in a developing country — the information centre dealing with cassava, at CIAT (International Centre for Tropical Agriculture) in Colombia. Initially, he says, the idea was simply to collect all the documents available on cassava, and compile a bibliography based on citations. It soon became evident, however, that what was needed was a range of services far beyond the traditional librarian's approach. The

emphasis was placed on satisfying the scientist's needs, rather than on "creating paper towers," as he puts it.

So successful was the cassava information centre that it became a model for the others that have followed. Over the years, IDRC has made grants available to help establish more than a dozen such centres, all of them based at existing research centres, to foster close cooperation between scientists and information specialists. Because of their narrow focus, most of these centres are small and relatively inexpensive to operate compared with the cost of generating the information they handle.

After the initial IDRC funding, the costs of some are now being absorbed into the core budgets of the international research centres where they are located, and thus receive long-term support from donors through such mechanisms as CGIAR. Another approach to the funding problem is that taken by AIT (the Asian Institute of Technology) in Thailand, which hosts several such centres — on ferrocement, geotechnical engineering, environmental sanitation, and renewable energy — enabling them to benefit from the reduced costs of shared services, while still maintaining charges that developing-country scientists can afford.

Because IDRC is one of the few development agencies with a separate information sciences program, and because of its experience in this field, it receives many requests for assistance in establishing such centres. In addition to the topics already mentioned, IDRC has also provided support for centres on tropical grain legumes, sorghums and millets, irrigation science and technology, cartography, and packaging technology. Topics under discussion for possible future centres include diarrheal diseases, aquaculture, potatoes, bananas, and South American camelids.

This trend is likely to continue as the "information explosion" makes the scientists' task of sifting through the available data more and more complex.

## Social Sciences Program

The Centre is fundamentally concerned with supporting research aimed at better meeting people's essential needs, particularly those people living in the rural areas of developing countries. In the broadest terms, the role of the Social Sciences Division is to help societies gain, through research, deeper understanding of the processes of development and their effects on people and social institutions. As such understanding grows, problems and solutions can be more clearly identified, and effective policies formulated to contain them.

In recent years, the division's style of



**Village in Indonesia: understanding the impact of rural development.**

operation has changed somewhat, moving away from large-scale projects and extensive networks, towards smaller grants for more projects. In the 1980s, the division sees the need particularly to support and

strengthen fragile new research structures, especially in the poorer countries. Increasing attention is also being paid to the development of social science research capacity in the more remote countries, and in



relatively underprivileged areas within countries.

In operational terms, the division is the second largest of the program divisions, accounting for about 29 percent of the total project budget. During 1981, the division initiated 100 new projects totaling some \$9.0 million.

The division's research support is focused in four sectors:

- Economics and rural modernization, concentrating particularly on economic policy and its impact on development, agricultural development, impact studies, labour supply and employment, and regional development studies;
- Science and technology policy, concerning issues such as national technology choices, the effects of technical change, the diffusion of technology, and markets for technology as they relate both to industrialization and to rural development needs;
- Population and development policies, including research into population redistribution, determinants of fertility and mortality, and studies of family-planning programs;
- Education, including research related to the basic cycle of education, studies on the transition from school to work, and encouragement and utilization of educational research.

During the past year, energy policy and urban policy have also emerged as distinct areas of program support.

The director of the Social Sciences Division, David W. Steedman, was appointed in 1978.

**The Year in Brief** — The question of how development programs affect the social structures of rural life continues to be a focus of the division's economics and rural modernization program. In Indonesia, researchers are studying three villages in an effort to understand better the impact of development programs and, in the remote Mustang region of Nepal, the division is supporting a study that will be used to formulate effective development programs for this unique mountainous area.

Improving living standards also requires more comprehensive agrarian policies. In

Brazil, a new project examining agricultural improvement programs will help in the development of policies at both the state and the national level. In neighbouring Bolivia, researchers are concentrating on analysis and improvement of present production and marketing policies. And in Uruguay to the south, a study is being made of the impact on small farmers of the country's "open-door" trade policy.

Trade policies have a major effect on all sectors of the economy. In Korea and Thailand, the division is supporting studies that will help these two countries reassess their commercial and tariff policies in the light of rapid industrial development. In Latin America, there is support for a series of research studies into the macroeconomic policies of countries in the region. In Ivory Coast, the division is supporting a program designed to meet the growing demand for highly trained research economists as the country's economy enters an important transitional stage.

The demographic impact of rural development efforts is a principal concern of the division's population and development research program. There were several grants during the year for projects to study the effects of government policies on rural employment. In Brazil, researchers are examining the causes and effects of internal migrations, particularly the impact on local labour markets. A study in Argentina is concerned with the effect of population on fertility and family structure.

International migrations also affect many countries. An increasing number of workers are leaving the Philippines for contract work in the Middle East. The division is supporting a socioeconomic study of these migrant workers, with their families and their communities, to gain a better understanding of the many consequences of this phenomenon. A Centre-supported study in the islands of the eastern Caribbean will assess the impact of long-term emigration patterns on the islands' economies. Similar studies in Guyana and Surinam on the South American mainland will also help government to formulate policies to cope with the problem.

Rural-urban migration is also the subject of a number of studies. In Colombia and Sri

Lanka, researchers are studying programs to upgrade squatter and slum communities. A four-country project in Southeast Asia is evaluating self-help programs in low-income urban communities. And, in Pakistan, a study is attempting to measure the impact of a government-sponsored program on basic needs.

The division's science and technology program is supporting several studies of both modern and traditional technologies — in Ethiopia, Ghana, and Paraguay — with a view to developing local capacity to generate technological solutions. At the industrial level, the program is supporting a study of local consulting engineering capacity in Peru, a review of the technological capacity of the chemical industry in Bangladesh, and an examination of how technological change affects small industries in Colombia. A major new project, involving six countries of Africa, Asia, and Latin America, is examining the significance of national development banks and their role in technological development — an area that until now has received little research attention.

In the energy field, several new projects were begun during the year dealing with energy policy and use. These are described in more detail later in this chapter.

The division's education program supports research into education at all levels — from an evaluation of preschool education in Thailand, to an analysis of adult-education policies in Ethiopia, India, Tanzania, and Turkey, based on a research model developed in Canada. In Mali, a Centre grant enables researchers to develop techniques for teaching basic arithmetic to illiterate farmers. In Upper Volta, researchers are evaluating a training program for village artisans that it is hoped will bring about the rapid spread of new agricultural implements.

The program also supports research into educational issues. Another project in Upper Volta is studying the relationship between formal education and productive work and, in neighbouring Zaire, researchers are studying ways to improve links between the technical education system and employers. In Chile, researchers are



**Women in adult education: problems and priorities for the developing world.**

examining the relationship between higher education and the country's economic development.

In Zimbabwe, an unusual project is examining the role of women in resettlement programs, and the best means of helping them resume their education, interrupted by the war in that country. The division is also supporting a large-scale study by the International Council for Adult Education on the educational participation of adult women. The study will identify problems and priorities in seven geographic regions of the developing world.



## Energy: Who Needs It?

The World Bank has called on the oil-importing, developing countries to integrate energy use into their development strategies. It adds that the domestic energy production of these countries "can and should" be doubled in the 1980s — at a cost of perhaps \$50 billion a year.

Laudable objectives, but to come up with such strategies and production programs, these countries need first to better define energy-use patterns and projected needs. They need policy-oriented research on energy for domestic and industrial requirements, so that their decisions can be made on the basis of information, not speculation.

The results of one such research project were published by the Centre during 1981: a study of domestic rural energy use and potential in Fiji. The study, carried out by the University of the South Pacific's Centre for Applied Studies in Development, with the aid of an IDRC grant, showed that rural Fijians are far better off than their counterparts in many other countries. All the eight villages surveyed have plentiful supplies of firewood, and 92 percent of the homes used wood for cooking. But the study revealed that, in some areas, supplies will become critical within 10 years and it recommended that the government begin at once to investigate fast-growing fuelwood species and to encourage the integration of fuelwood cultivation into existing agricultural systems.

This was just one of a series of recommendations by the researchers dealing with every aspect of rural energy, from the dangers of cheap kerosene heaters, to the health hazards of cooking over an open fire, to the use of energy alternatives such as biogas. The report has been welcomed by the government's Central Planning Office, which is attempting to develop effective energy policies that will minimize the need for costly, imported, petroleum products.

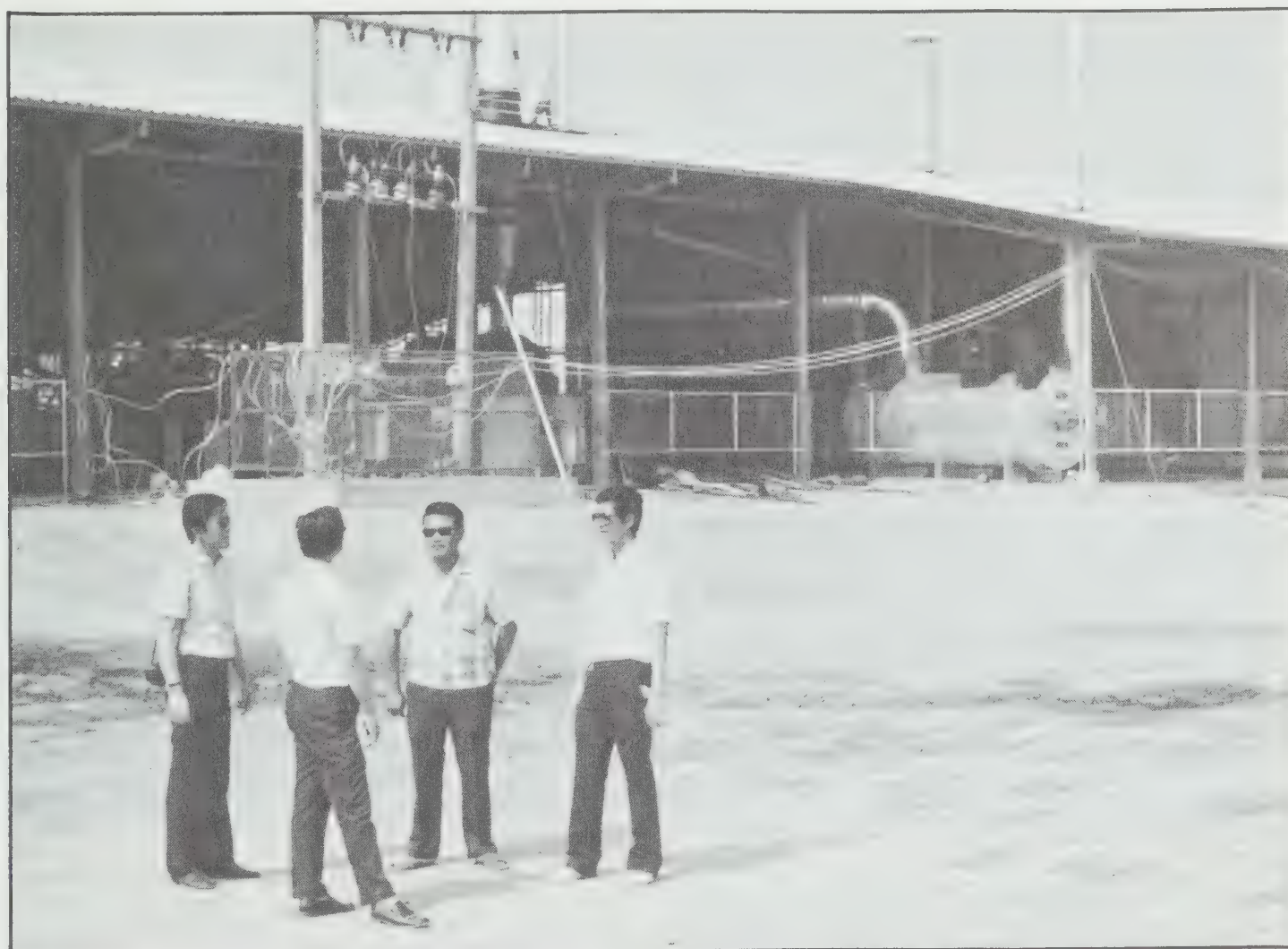
As in rural Fiji, so in rural Thailand: remarkably little is known about the energy-use patterns of the 80 percent of the population who live outside the cities. They, too,



Rural Fiji: no energy shortage — yet.

depend predominantly on wood, but it is feared the forests cannot long sustain the present rate of consumption and the government, although committed to reducing oil imports, lacks the information on which to base rural energy policies.

Here the division's science and technology policy unit is supporting a much larger-scale study. Researchers will survey households in 24 villages in eight regions. To ensure that they get the most accurate data possible, many of the research assistants are actually living in the villages during the year-long survey. In this way, they will gain a unique insight into the seasonal pattern of energy use and its relationship to socioeconomic factors and local conditions.



**New factory at Khon Kaen, Thailand: coping with the energy crisis.**

The project is being carried out by researchers at the Thailand Institute of Scientific and Technical Research (TISTR) by researchers who, two years earlier, undertook an IDRC-supported study of the

economic and social aspects of rural biogas-energy systems. Subsequently, they developed the proposal and methodology for the present, much broader project, which they felt was needed to understand the rural



energy economy as a whole. During 1982, the results of the field work will be comprehensively analyzed, and the data condensed into a report and a set of policy guidelines for the development of renewable energy resources, for rural areas, which will be presented to the government's newly formed National Energy Administration (NEA).

Another project with TISTR, begun this year, was developed by a young Thai electrical engineer who became involved in this field through the biogas study mentioned earlier, and subsequently received training in energy-policy research through an IDRC-sponsored workshop program. This project is concerned with urban problems of industrial energy. Its main purpose is to examine the technical changes that have come about as the fast-growing Thai manufacturing industry has learned to cope with dramatic changes in the price and availability of commercial fuels.

This pioneering study should go a long way towards suggesting what policy action is needed by the NEA to ensure that industry responds efficiently to changing energy markets. Such action could be of major importance to the economy as Thailand struggles to improve its balance-of-payments situation.

The government of Sierra Leone is also concerned about the cost of foreign oil, which accounts for more than 50 percent of

the country's import bill. Yet oil is thought to satisfy only 50 percent of urban demand and 10 percent of rural demand for energy. Like many developing countries, however, this West African nation has only sketchy information on the present use of energy and probable future demand.

As a first step to establishing a rational energy policy, an IDRC-supported study is gathering preliminary data on current energy consumption, likely demand, and possible indigenous energy sources. The researchers' report, which should be available early in 1983, will be channeled directly into the government policy-making process through the Ministry of Energy and Power, which has shown considerable interest in the research. The project will also help greatly to develop much-needed local capability in energy policy research.

## Cooperative Programs

Established in October 1980 in response to the need for greater access to research expressed by the developing countries at the UN Conference on Science and Technology for Development, the Cooperative Programs Unit adds a new dimension to the Centre's project-support capability.

The main aim of this new program is to promote collaboration between research groups in the developing countries and their counterparts in the Canadian scientific community, whether academic, governmental, or private. By providing increased opportunities to work with Canadian research institutions, the program will strengthen the scientific and technological



**University of Alexandria campus: studying business enterprises.**

capacity of the participating Third World institutions. By establishing channels of communication among scientists, it is designed to improve the transfer of research results and the experience gained by the Canadian participants should influence the Canadian scientific community toward a greater concern for the problems of the developing countries.

The program does not focus on any particular discipline or field of research. It can provide support for specific research activities in any field that is of demonstrated importance to developing countries, and in which there is recognized Canadian expertise. The program supports collaboration among institutions, however, not individual researchers. It also supports training for



developing-country researchers, where this is directly related to other approved research activity.

Many of the projects funded from the Cooperative Programs budget will complement the ongoing work of the Centre's four main program divisions and such projects will, in fact, be managed by the divisions concerned, keeping Cooperative Programs staffing requirements to a minimum. Several projects were implemented in a variety of fields during the new program's first year. These include:

- A study of the management of business enterprises in the Egyptian economy, involving the University of Alexandria and economists and management specialists from several Canadian universities with expertise in the field;
- The development, by the Technical University of Nova Scotia and the Atlantic Bridge Company, of a small-scale fish deboner for use in a project in Thailand that is encouraging the use of fish by-catch from shrimp trawlers as a new source of food;
- A project to control mosquitoes in the South Pacific islands, through a combination of biological control techniques and public health education, to be carried out by researchers from Memorial University, Newfoundland, in collaboration with the South Pacific Commission;
- Collaboration between the University of Saskatchewan and the International Centre for Agricultural Research in the Dry Areas (ICARDA) to establish an information service on lentils research;
- A training project at Dalhousie University for technicians and field supervisors involved in a network of IDRC-supported research projects on the culture of bivalves, such as oysters and mussels, in eight countries.

During 1981, Cooperative Programs appropriated grants for 10 projects, totaling some \$1.1 million. The program is expected to grow rapidly in the year ahead as experience is gained and its operation becomes more widely known among research institutions in Canada and in the developing countries. There will probably be opportunities for involvement with the



**Laboratory at Memorial University: controlling mosquitoes.**

energy research program, enabling developing countries to benefit from Canada's considerable expertise in the energy field.

The Director of the Cooperative Programs Unit is Jim Mullin, a scientist formerly with Canada's Ministry of State for Science and Technology, who joined the Centre in August.

The Centre has always placed considerable importance on the publication and dissemination of research results. IDRC's Communications Division produces a wide range of technical and scientific materials for worldwide distribution, particularly in the developing countries. It also produces more general materials, such as this review, to inform the public about the work of the Centre. A list of publications and films produced by the Centre during 1981 follows. Catalogues of all current IDRC publications and films are available on request.

## IDRC Monographs

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## The IDRC Reports/Le CRDI Explore/El CIID Informa

Published in three separate language editions, this is a quarterly magazine of report and comment on the work supported by IDRC and on related activities in the field of international development. Total circulation of the English, French, and Spanish editions is about 14 500 per issue, of which approximately 50 percent is to the developing countries, 40 percent within Canada, and the remainder to other countries.

The magazine is published in January, April, July, and October; Michelle Hibler is Editor-in-chief.

## IDRC Features/ Reportages CRDI

This monthly news feature service on scientific, technical, and educational subjects related to development is provided free of charge to selected news media in the developing world. During the past year, 50 articles, many of them written by IDRC staff with others by selected contributors, were distributed in English and French to some 500 publications in 86 countries. Arrangements have also been made with several Third World-based agencies producing features services to distribute IDRC Features to an even wider audience. Clippings and comments on the materials distributed are received from editors of publications as far afield as Argentina and Zambia.

## Films

### **Project IMPACT: The Overview —**

Project IMPACT is an experiment in primary education supported by IDRC in Indonesia and the Philippines. Launched in 1974 by the Regional Centre for Educational Innovation and Technology (INNOTECH), it now forms the basis for similar systems being developed in Bangladesh, Jamaica, Liberia, and Malaysia. This 16-mm colour film runs 27½ minutes, and was produced by Neill McKee for IDRC and INNOTECH.





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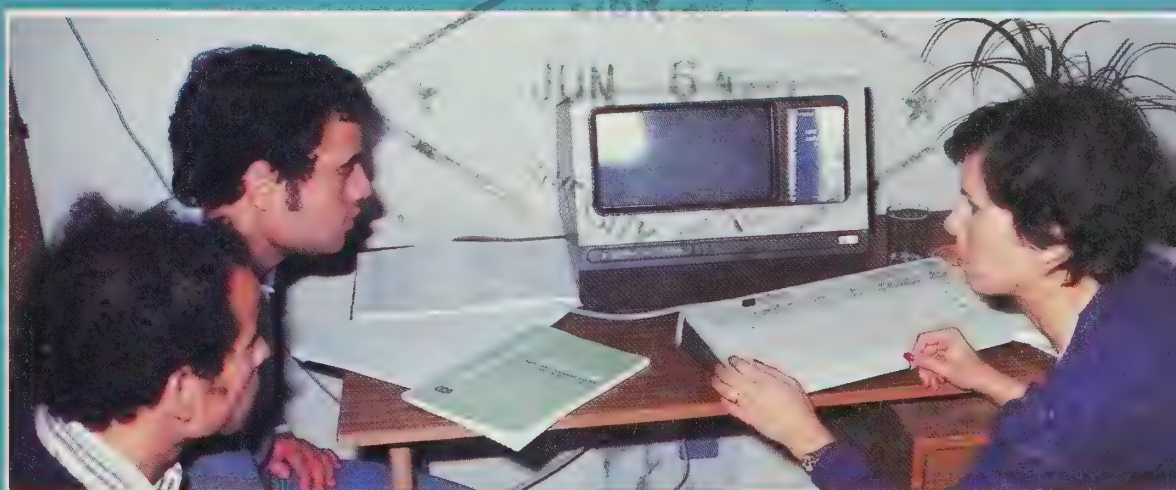




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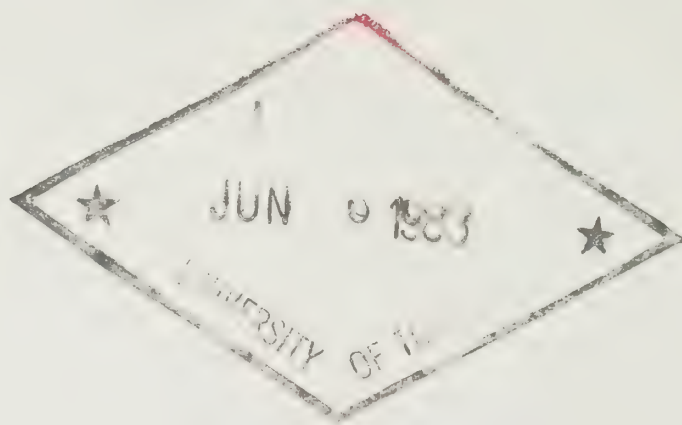
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## Review of IDRC Activities 1982



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Review of  
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The ability to look ahead, to plan for the future of one's family, is instinctive. It is also a sign of maturity, argued Dr Brock Chisholm, a Canadian and first Director General of the World Health Organization. Small children look ahead only a few weeks, said Dr Chisholm, while adults think of the prospects of future generations: of their own children and their children's children.

Planning is not restricted to individuals, of course. Entire societies and national governments plan for the future. Not all are equally successful, however, in taking the decisions necessary to ensure that their plans come to fruition. Nor are all the essential elements ever within the control of a single nation. A



IDRC President, Ivan L. Head, on the left, with Willy Brandt at the 1982 meeting of the Brandt Commission at the Centre's headquarters in Ottawa.

successful future is one that blends sound domestic decisions and practices with equally sound international processes and undertakings.

One of the domestic ingredients, certainly, is the conduct of research to ensure that local solutions can be found for local problems. One of the international ingredients is an awareness of the interdependence of all economies and all ecologies.

There were signs in 1982 that each of these ingredients is gaining strength. Developing countries increasingly are encouraging research activities within their own borders; and the international community has begun, however timidly, several important initiatives to strengthen institutional cooperation.

Research does not postpone decisions. Rather it ensures that decisions, when taken, reflect accurately and



4

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wisely all the essential criteria. These include social and political factors that cannot be assumed or predicted from abroad. The advantage of locally pursued research is found in the increased experience and competence gained by local scientists, and in the assurance that local priorities, local concerns, and local biases are all adequately considered and weighed. Soil and climatic conditions cannot be replicated easily in far-away laboratories. Nor can cultural practices, which bear so heavily upon the effectiveness of preventive health programs, be thoroughly understood by persons of foreign origin and environment.

The resources available to the International Development Research Centre from the Parliament of Canada continued to expand in 1982 and, happily, the call upon those resources by scientists in developing countries grew apace. During the year, 261 new projects of a promising and often innovative nature were approved by the Centre's international Board of Governors.

A major contribution to governmental awareness of the interdependent nature of the world's economies was the 1980 Report of the Brandt Commission. The Commission gathered again in 1982 to examine international events since publication of its findings. In its final meeting, at IDRC's headquarters in

Ottawa in December, the text of a new memorandum was approved, to be published early in 1983 under the title "Common Crisis." In his introduction to that document, Willy Brandt poses the essential question: "We reaffirm our conviction that change is inevitable. Will the world community take deliberate and decisive steps to bring it about, or will change be forced upon us all through circumstances over which the international community will have little control?"

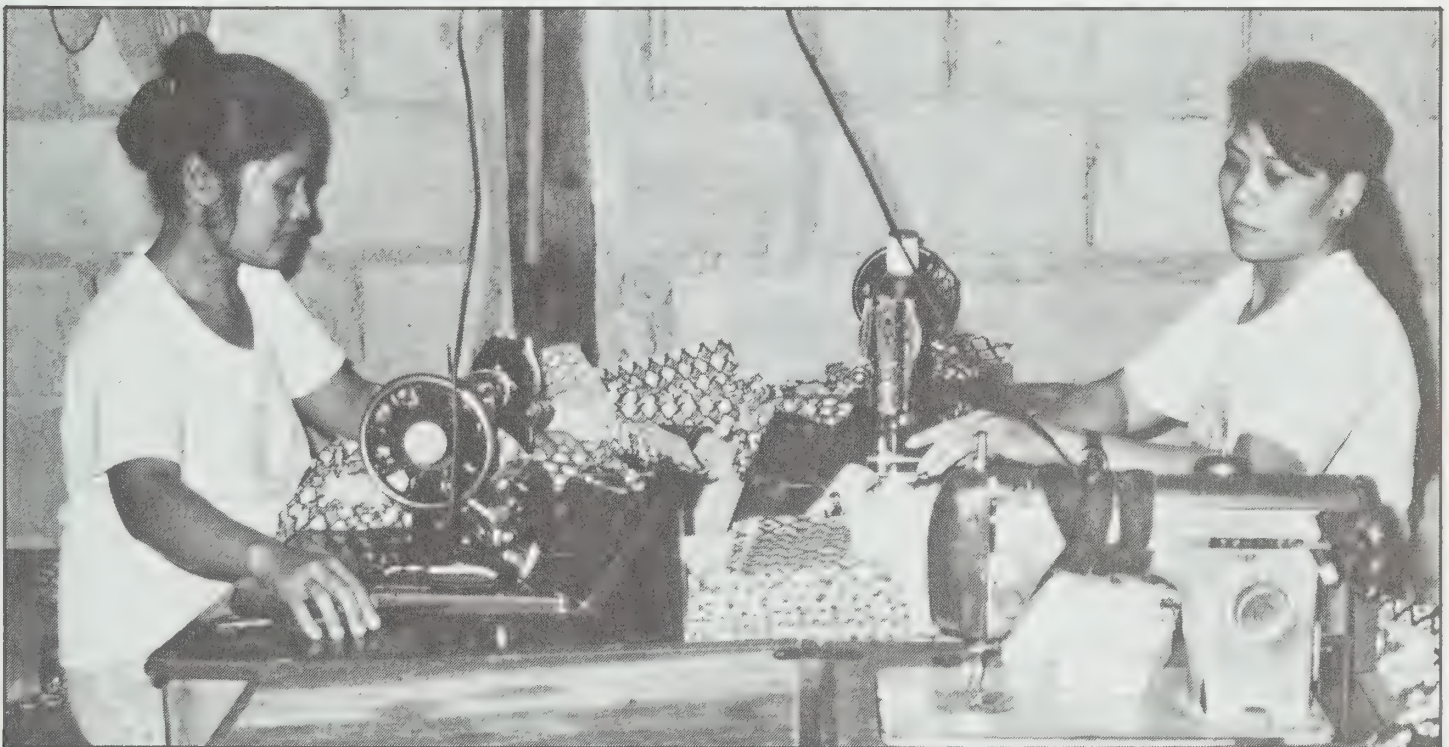
IDRC, modestly though effectively, is contributing both to change and to its wholesome management.

Ivan L. Head  
President, IDRC

## Engines of Growth

Agriculture is the key to countries' overall development, says the *World Development Report 1982*. According to this World Bank publication, "Economic growth has gone hand in hand with agricultural progress." Few countries, it notes, have achieved sustained economic growth without first — or simultaneously — developing their agriculture.

The relationship is complex. As subsistence farming gives way to marketed production, the scope of specialized marketing, transport, preserving, and processing is enlarged. Employment expands and diversifies. Activities



Cottage industries: as subsistence farming gives way to marketed production, employment expands and diversifies.

formerly carried out on the farm — the manufacture of clothing and tools, house construction, processing, education, and medical care — become separate industries and services that open up new opportunities, many of them requiring specialized skills and training.

As incomes in agriculture are usually lower than in the "modern" sector, nonagricultural activities draw ever-increasing numbers of workers. This movement of labour from agriculture to industry and services is the key to raising incomes and production.

This process certainly occurred in the now highly industrialized countries of Europe and North America where a dynamic agriculture accompanied, or led, industrialization and economic growth. According to the World Bank, the same process is now occurring in developing countries. In the 1970s, developing countries with high agricultural growth rates also experienced high growth rates in their Gross Domestic Product (GDP) — Colombia, Indonesia, Kenya, Malawi, Tunisia, and Turkey were among those affected in this way.



There are many important linkages between agriculture and the rest of the economy. Expanding agricultural production creates a demand for fertilizers, transportation, commercial services, and construction. Agricultural households, which form the bulk of the population of developing countries, are also the basic markets for a wide range of consumer goods — from textiles to processed foods, radios to bicycles.

Agricultural growth does not occur spontaneously, however. It requires effective policies and institutions, supported by the application of research and technology to food crops, from the development of high-yielding varieties to better means of preserving the larger harvests. It also requires collaboration between public and private sectors. Farmers' efforts need to be supported by public action in the key areas of agricultural research and public investment, notably in irrigation, storage facilities, and transport infrastructures. Ultimately, however, it is the farmers who must take the risks in the hope of reaping the rewards.

Minimizing the risks while maximizing the rewards is at the heart of the preoccupations of the International Development Research Centre, most directly through its Agriculture, Food and Nutrition Sciences (AFNS) Division.

Starting from the premise that agricultural development is a process of evolution, assisted by human ingenuity and industry, the division's programs — like those of the Centre's other program divisions — stress the need to consult and cooperate with the people whom the research is intended to benefit. And it emphasizes the importance of a systems approach to research, ensuring that the physical, economic, and social climate in which people live and work is understood.

The importance of agriculture cannot be overstated: at least 70 percent of the population of developing countries draw their livelihood from agriculture. Higher production is not only essential to raising their incomes, but also to providing them with better nutrition. In the 1970s, agricultural production in developing countries did increase, by some three percent per year: but populations also grew rapidly. In many countries, the net gain in food per person was minimal, and millions of farmers did not share in the progress.

As new land for agriculture becomes ever scarcer and won at ever higher prices, further increases in production must come through intensifying production. Higher-yielding varieties, more productive cropping systems, better management of resources, and the careful integration of livestock, food crops, and trees — all must contribute. These are all major thrusts of the AFNS program.

But agricultural development alone will not alleviate the absolute poverty in which close to one billion people now live. The great majority of these people — over 90 percent — live and work in rural areas. Up to one-quarter of them are landless.

To help these people, specific programs of human development must be implemented. The elements of human development — health, education, nutrition, and fertility control — are closely interrelated. Improvements in one area facilitate and reinforce all aspects of development.

Two of IDRC's program divisions are concerned with these aspects of human development. The Health Sciences program seeks to develop better means of delivering medical care in rural areas, to improve water supply and sanitation services, and to find effective tools for combating major tropical and endemic diseases. And, because the problem of poverty has been linked to high population growth, safe, effective means of fertility control are also being studied.

Through its Social Sciences Division, IDRC supports studies on various aspects of the rural economy, from the impact of agricultural development projects to off-farm employment. Its education component seeks to find the least



**Sperm inhibition research: the link between poverty and rapid population growth is complex.**

costly, most effective means of making schooling available to both children and adults.

Recognizing that industrialization is under way in most developing countries, the division also supports research on science and technology policy to help decision-makers work toward a successful transition from agrarian to industrial economies. The population movements that ensue are also the object of research by the Social Sciences Division. And the support of research into the often accompanying industrial and occupational diseases is being increased by the Health Sciences Division.



**Parents and children: schooling available to everyone.**

Because policies and programs cannot be formulated without reference to valid information, the Information Sciences Division promotes cooperation among nations in the collection and dissemination of recorded knowledge, thus avoiding the wastage of scarce human and financial resources. In its support for information projects in the fields of agriculture, health, population, education, and economic planning, the division's work complements the Centre's other three program divisions.

Agriculture and nutrition, health and population control, education and appropriate policies, and information —





Cataloging in India: nations must share in the collection and dissemination of knowledge.

improvements in these areas can not only alleviate the worst aspects of poverty, but also create a momentum for sustained development; it is little wonder they are often referred to as the engines of growth.

Remarkable progress has been made in the past few decades. The rise in agricultural production confounded the predictions of widespread famine that were rampant in the 1950s and 1960s. Population growth is slowing and literacy rates are much improved.

Further improvements may prove more difficult, and more expensive. However, the application of appropriate policies and of scientific and technological development can ensure that they are realized.

How IDRC-supported research is helping developing countries achieve their potential, how the Centre is helping to fuel the engines of growth, is described on the following pages in a brief review of Third World research programs being supported by IDRC.

## Agriculture, Food and Nutrition Sciences Program

Land improvement, new farming methods, better crop varieties, and more research are all necessary requirements for agricultural growth. But they will not succeed unless they take into account the people that they are intended to benefit and their social, economic, and physical environment.

That is why the Agriculture, Food and Nutrition Sciences Division of IDRC has, since its creation in 1970, concentrated most of its efforts in support of applied research for the benefit of rural people in developing countries. It has stressed the need to both consult and cooperate with the farmers, and it has emphasized the importance of a systems approach to research.

Neglected peoples, neglected crops, and neglected lands have received considerable attention in the projects supported by the division. The semi-arid regions of the world are the main focus of much of the division's project support, but improving the livelihood and productivity of rural peoples in quite different, equally neglected, regions is also stressed — the High Andes of Latin America, for example.

During 1982, 63 new projects were initiated by the division, totaling some \$16.5 million in grants. They are divided, by discipline, into five sectors:

- Crops and cropping systems: Emphasized are foods such as cereals, legumes, oilseeds, and root crops that provide most of the food energy and nutrients for the majority of people in developing countries. Other areas of concentration include multiple-cropping systems, fertilizer efficiency, and the control of weed and insect pests.
- Fisheries and aquatic resources: The greatest emphasis is on the aquaculture of finfish, shellfish, and aquatic plants. Studies also include the control of fish parasites and diseases, the development of artisanal fisheries,

and the management of coastal ecosystems.

- Forestry: Trees not only provide food and fuel, but also play an important role in soil and environmental conservation. The program therefore emphasizes reforestation, the creation of village woodlots, tree improvement, and forest-products utilization.
- Animal sciences: Integrated animal production systems for small farmers and pasture improvements are stressed. High priority is also given to native animal species and the use of agricultural by-products as feed.
- Postproduction systems: Focused on the total sequence of events from harvest to consumption, the program emphasizes food conservation and processing. Great attention is paid to the nutritional needs of consumers.

In carrying out its program of work, the division has contributed to specific programs within the international agricultural research centres and was a founding member of the Consultative Group on International Agricultural Research (CGIAR). In those areas where no relevant agricultural centre exists, project networks have been established to ensure the sharing of information. Some fundamental studies are also supported, most often at Canadian institutions in cooperation with Third World scientists.

Joseph H. Hulse has been the Director of the Agriculture, Food and Nutrition Sciences Division since 1970.

**The Year in Review** — The World Bank predicts that food demand will increase by at least one-third in the next decade. For the more than 100 countries that are already food importers, and lack the foreign exchange for greater imports, concerted action is urgently needed to increase domestic production.

The approach that holds the best promise for increasing food availability is producing more per unit of land through the use of higher-yielding varieties and improved agronomic practices. Thus, the AFNS Division has emphasized research on crops and cropping systems.



The protein in food legumes, in part because of its high lysine content, is complementary to that of cereal grains. When eaten together, legumes and cereals provide excellent nutrition. Efforts to increase the production of these important foods continued during the past year as a number of legume projects entered a second or third phase of activity.

In Upper Volta, for example, high-yielding varieties of cowpeas that resist diseases, insect pests, and drought have been selected and are now being tested on farms. At the International Center for Agricultural Research in the Dry Areas (ICARDA), based in Syria, work is continuing on the breeding of resistant and



Research into high-yielding varieties of cowpeas: the quest for excellent nutrition for all.

high-yielding varieties of chickpeas, lentils, and faba beans. The results of this regional program will be demonstrated and adapted to the countries served by ICARDA, from Bangladesh in the east to Morocco in the west.

In Mozambique, groundnuts are grown for food and sale by half the population. Research to increase production and yields, begun three years ago, entered a second phase this year. The project will now benefit from a new regional project based in Malawi. It is carried out by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT),

which has the world responsibility for groundnut improvement.

The protein in oilseeds is also nutritionally complementary to that of cereals, but oilseed production is inadequate to meet the needs of developing countries. In Egypt, researchers completed the first phase of a project to breed better varieties of sesame, sunflower, groundnut, and rapeseed. A new project to improve oil crops in Ethiopia's lowlands was also approved this past year.

In many countries, root crops such as cassava, sweet potato, and yams are the major sources of food, or are grown as insurance against failure of other, riskier crops. In Liberia, researchers are working on realizing these crops' potential by breeding varieties that are resistant to common pests and diseases and are adapted to the country's wide range of environmental conditions. A similar approach is being followed in Rwanda, the most densely populated country in Africa.

A combination of root crops, cereals, and legumes is the focus of a large collaborative project in the High Andes of Peru. During the first phase of the project, considerable progress was made in understanding traditional crop-production systems and in introducing improved varieties of field crops. In a second phase, begun this year, trees and fruit crops will be included.

A second phase was also approved for a project being carried out by the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) in Costa Rica to evaluate drought-resistant crop varieties and design agricultural technology for small farms in the semi-arid regions of Central America. In the humid lowlands of Central America, root crops and plantains are the major food sources, but until recently these crops were largely neglected in favour of export commodities. With the establishment of CATIE in 1973, this trend has been partially reversed. Several CATIE projects have been supported by IDRC, including a new one to develop cropping systems for



yams, cocoyams, sweet potatoes, and plantains.

Plantains are a banana, a plant that originated in Southeast Asia. In the Philippines, small farmers grow 90 percent of the banana crop. To improve their production, researchers have begun a three-year project that will establish a tissue-culture laboratory, evaluate promising varieties, and develop banana-based cropping systems.

Developing improved varieties of crops is only one thrust of the crop sciences program. Equally important is the establishment of more-productive cropping systems. A number of projects entered a second or third phase this past year in Bangladesh, Colombia, Mali, Syria, and Thailand. An outreach project is also adapting the results obtained at the International Rice Research Institute (IRRI) on rice-based cropping systems to the needs of many Asian countries, including Burma, Nepal, and the People's Republic of China.

Marginal lands that will not support food crops can be made to yield much-needed protein. A number of projects have shown that animals, ruminants in particular, can be pastured in areas unsuited to crop production, or can subsist on agricultural wastes. Although most research on animal production has been carried out in Latin America, a new project was launched in the Philippines where goats are gaining popularity as a "backyard crop." To solve the problem of feed shortages during the dry season, researchers are evaluating the use of leaves from the leguminous *Leucaena* tree. Feed availability is also an important component in a new dairy-farming project in Tanzania. A detailed account of the animal sciences program can be found on page 12.

Expanding aquaculture also holds great promise for increased supplies of animal protein and the division has supported more than 50 projects aimed at fostering the cultivation of aquatic plants and animals. Many of these projects have been carried out in Southeast

Asia. In the Philippines, where milkfish were being reared in ponds some 450 years ago, before the arrival of the European explorer Ferdinand Magellan, IDRC is actively supporting research to help solve the shortage of milkfish fry. The success achieved in getting the milkfish to breed in captivity is documented in a new IDRC film (see page 40). The project is continuing, in a third phase, to standardize the production of fry and to develop effective methods of pond management.

Cageculture — the raising of native fish species in large cages immersed in ponds, lakes, rivers, and canals — is particularly promising for many regions. In Sri Lanka, cage systems are being



**Harvesting milkfish in the Philippines: closer to the promise of animal protein from aquaculture.**

developed for lagoons and irrigation tanks. Now starting a second phase, the project will disseminate the technology among farmers and fishermen. A second-phase project is also under way in the Dominican Republic where cageculture of *Tilapia* and carp has proven practical and profitable.

In the Caribbean, diversification of the fishery industry is being emphasized.



Researchers in St. Kitts–Nevis began in 1982 to develop methods of growing molluscs in protected bays. In Jamaica, biological studies and development of basic technology for oyster culture were completed and a second phase of the research started this year to build a self-sustaining industry.

Food availability can also be greatly increased through improved methods of conservation, processing, and distribution. In many countries of Africa, lack of adequate means of processing has limited the expansion of production of native cereals such as sorghum and millet, as well as of legumes. A number of projects have shown that a small abrasive dehuller could be adapted to effectively dehull tropical cereals and legumes. The dehuller was developed by the Prairie Regional Laboratory of Canada's National Research Council, in collaboration with scientists in Nigeria, Sénégal, Ghana, the Sudan, and Botswana. Two new projects are now introducing the dehuller to Zimbabwe and Ethiopia. In Botswana, the dehuller has proven successful at a pilot mill and researchers are now optimizing the design and improving the manufacturing process.

Postproduction research in Asia has focused on rice, and a network of projects is continuing the search for improved dryers, threshers, dehullers, mills, and storage facilities. Because the postproduction technology of other food crops has been neglected, new projects are concentrating on sweet potatoes in the Philippines, groundnuts in Thailand, and fruits and vegetables as well as rice in Bangladesh.

The third project of a series to apply research methodologies to important small-scale food industries was supported this year. In Chile, bread-making is the largest food sector and researchers have begun a comprehensive study aimed at improving the quality of the product from family-run bakeries. Also in Chile, a new project will develop a small fish-processing industry for coastal villages. The development of this artisanal industry will have a second

benefit: providing low-cost, high-protein products for use in the country's school feeding program.

The AFNS Division, long a recognized leader in the field of social forestry, is expanding its forestry program. Two of the rapidly growing research networks deal with bamboo and rattan. New projects have been launched in Thailand and China to increase the production of these versatile materials and establish collections of the most useful species. A similar project was initiated in the Philippines.

Also in the Philippines, researchers completed the first phase of a project on *Leucaena* and are continuing the development of this tropical legume for the production of wood, fuel, forage, and fertilizer. Another leguminous species, *Erythrina*, is being studied in Costa Rica.

In Nepal, large-scale deforestation, which has led to fuel shortage and soil erosion, is creating hardship for rural people. Researchers are now selecting the best tree species for farmers to plant as a source of fuelwood, fodder, green manure, and timber. Similarly, in Zimbabwe, another project aims to establish plantations in arid and semi-arid zones, both to protect the natural forests and to provide a much-needed source of firewood.

The division also continues to support the International Council for Research on Agroforestry (ICRAF) and sponsors training seminars for young forestry research workers.

## The Animal Connection

"Sheep eat men." So said peasants in 17th century England after being thrown off common lands to make room for private fenced pastures. Today, livestock are more often described as "reverse protein factories," consuming more protein in the form of cereals than they produce as meat.

It is true that animals consume 500 million tonnes of grain each year — one-third of the world's production and enough to feed 2.5 billion people; but the issue is not that simple. Most of that



consumption takes place in industrialized countries where cereal markets would be reduced drastically were it not for the livestock industry. In developing countries, 80 percent of cereals are still consumed directly by people.

Animal production is growing in developing countries in response to both increased population and increased demand. Studies by the International Food Policy Research Institute (IFPRI) clearly indicate that, as nations develop and as their Gross National Product (GNP) increases and more money finds its way into the pockets of their people, the demand for meat increases.

Animals provide more than meat. In many cultures, they are capital, security, prestige, and social currency. They also provide a host of products — leather, wool, and down — that are money-earners. Cattle dung provides both fuel and fertilizer. Draft animals are a source of energy for small farms in most developing countries. Animals can also make good use of, and even improve, marginal lands that will not support crops, and can convert agricultural and other wastes into food.

Despite continuing increases in production, however, developing countries are not as a rule very efficient in their animal production systems. Africa, Asia, and Latin America have two-thirds of the world's cattle, but they produce only one-third of the meat. They have just over half of the world's dairy cows, hens, and pigs, but they produce only one-quarter of the world's milk and a little more than one-third of the world's eggs and pork.

Ways must be found then to increase production without necessarily increasing the number of animals. That is the mandate of the animal sciences program. In the past 10 years, some 65 projects have been supported under the program.

A number of these projects have demonstrated that, in integrated farming systems, animals can subsist on pastures grown on marginal lands, supplemented by raw and processed agricultural by-products unsuited for human

consumption. Half of these projects have been in Latin American countries, reflecting the importance of animals in the region's farming systems.

Of the program's three main thrusts — pasture improvement, by-products utilization, and animal production systems — the last is now receiving the greatest emphasis.

Animal production systems could equally well be called animal-crop systems. Farms that combine crop and animal components are, in fact, the dominant systems in most developing countries and the interactions between crops and animals have a major impact on the productivity and efficiency of the farm. Some interactions are direct: crops and



**In developing countries, animals provide more than meat.**

animals compete for land, labour, and capital; crop residues are fed to animals; animal power is used for cropping activities; animal manure is used as fertilizer; and forage crops are combined with food or cash crops. Maximizing the benefits of these interactions is what the program is all about.

A network of research projects now extends from the Peruvian Amazon into Central America. And, although the local conditions and specific objectives vary, the basic methodology that they follow is essentially similar: each project begins



with a detailed study of the existing production systems and the identification of the farmers' constraints; alternative, improved management methods are then developed, evaluated, and demonstrated to farmers.

Panama, for example, imports more than half of the milk consumed in the country. Sixty percent of domestic production — some 42 million litres — comes from more than 30 000 small farms that also produce beef. Production on these farms is low because of poor pasture management and lack of feed supplements for the cattle.

The animal science team at the Instituto de Investigación Agropecuaria de Panamá (IDIAP) believed that livestock production in Panama could be increased considerably by developing improved feeding systems for these small dual-purpose farms. The new systems would be based on the existing "faragua" grass pastures, but complemented with legumes, by-products, and forage conservation techniques to make feed available during the dry season. IDRC supported their efforts in 1977.

A diagnostic study of producers in three regions of the country helped the team to identify production constraints. After several studies, promising techniques were developed for pasture management and dry season nutrition. During the first two years of the project, the improved feeding systems resulted in a 70-percent increase in milk production in the experimental herd.

The research is continuing to evaluate and further refine improved dairy-beef production systems for the three regions. A close working relationship has developed between the researchers and the farmers.

The Panamanian team receives technical assistance from CATIE in Costa Rica, the coordinator of the research network, where tropical crops and crop residues in the feeding of dual-purpose cattle has been studied since 1976.

Problems differ in the Peruvian Amazon where migrants are settling in forest clearings and destruction of the

vegetation causes rapid loss of soil fertility. Appropriate combinations of pasture grasses and forage legumes would protect the cleared lands, improve soil fertility, and sustain the cattle population while providing employment, food, and income for the settlers. Increased livestock production would also reduce the heavy reliance on imported meat and milk.

In a project begun in 1979, scientists from the Instituto Veterinario de Investigaciones Tropicales y de Altura (IVITA) are endeavouring to introduce pasture grasses and legumes and establish efficient management practices. Similarly, in Guyana, the emphasis is on establishing pastures and on using local by-products to increase milk production. The project benefits from the results of an earlier IDRC-supported project carried out in three West Indian countries that identified adaptable and productive forage grasses and legumes.

From Latin America, the animal production systems network has reached out to the Philippines and Tunisia and, during 1982, to Tanzania and Zimbabwe. All these projects stress native rather than exotic breeds of animals whose production is integrated with food and perennial tree crops, pasture grasses, and leguminous browse trees.

These projects are complemented by the tropical pastures network, by work being carried out around the world on by-products, and by a new program on minor species — from bees to camelids. They can all help increase the supply of animal protein in developing countries, where it is most needed, without adversely affecting the production of other valuable food crops.

## Health Sciences Program

In 1980, inhabitants of low-income countries could expect to live an average of 57 years; they would see close to 11 percent of their children die before their fifth birthday; and six thousand of them depended on one physician for their care. Dismal though these figures may appear, they are better than in 1960 when life expectancy was 42 years, infant and child mortality was 19.3 percent, and one physician cared for close to nine thousand people.

Despite these improvements, however, it is clear that the fundamental right to health is still denied to a large part of humanity. It is to help find ways to improve this situation that the resources of IDRC's Health Sciences Division are being put to use.

The goal of the division is to help developing countries provide a better standard of health for their people. It emphasizes those areas where it feels the application of research results — and the resulting stimulus to local research capability — can have the greatest impact.

The division also participates in major international research efforts such as the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases, the WHO Global Diarrheal Diseases Control Programme, and the work of the International Committee on Contraceptive Research (ICCR).

Some 17 percent of the Centre's project budget was appropriated by the Health Sciences Division in 1982. Close to \$6.9 million was allocated to 41 new projects in the following areas:

- Communicable and noninfectious diseases: The fastest-growing of the division's programs, it emphasizes diarrheal and tropical diseases and studies of the relationship between malnutrition and infection as well as other key health problems such as tuberculosis and acute respiratory illness in children.

- Fertility-regulation methods: Broadened to include social obstetrics and studies of the effects of poor nutrition on mother and child, this program focuses on the development of safe, reliable methods of contraception and on studies of their effects on health, it also includes studies on sexually transmitted diseases.
- Rural health-care delivery: Studies of rural health-care needs, training and personnel requirements, and the cost-effectiveness of programs are stressed. Also included are delivery systems for basic health care such as oral rehydration therapy.
- Water supply and sanitation: The social, educational, and training aspects of such programs are being emphasized along with the development and evaluation of simple, effective technologies for rural areas.
- Occupational health: The health problems of workers in both industry and agriculture are the focus of this recent program.

Elizabeth J. Charlebois was appointed director of the Health Sciences Division in 1982. A sectoral reorganization has taken place and previous activities have been regrouped and expanded into the following four sectors: Tropical and infectious diseases; Maternal and child health; Water supply and sanitation; and Occupational and environmental health.

**The Year in Review** — "The last few decades have not been altogether favourable ones for world health," says the World Health Organization's *Sixth Report on the World Health Situation*, citing the proliferation of climatic calamities, wars and civil unrest, population growth, inflation, and dangerous chemicals.

Yet progress is being made. Large global programs, such as the Special Programme on Tropical Diseases, are yielding information on the epidemiology of hitherto little-understood tropical diseases, and are developing better diagnostic tools as well as safer, effective means of treatment. IDRC supports



the work of the Special Programme, but it also funds directly individual projects with complementary aims.

This year, a new project was launched in Colombia where *Leishmaniasis*, a parasitic disease transmitted by sand flies, poses a major health problem. Because some forms of the disease are resistant to therapy and relapses are frequent, the researchers are examining the relationship between the clinical forms of the disease and response to therapy.

Many diseases endemic in tropical areas are not covered by the UNDP/World Bank/WHO Special Programme. One of these is dengue hemorrhagic fever, widespread in Southeast Asia and the South Pacific. Although a less-virulent form is common in the Caribbean, there was an epidemic of the severe form in Cuba in 1981. Researchers are now examining the factors that may have contributed to the epidemic. This project complements other Centre-funded projects in Asia that seek a better understanding of this disease.

The most common causes of illness and death in young children in developing countries are diarrhea and acute respiratory infections (from the common cold to pneumonia). In India, for example, acute respiratory infections are responsible for up to 40 percent of illnesses and 30 percent of deaths in children. Over the last two years, IDRC has worked closely with international health bodies and research institutes to develop a research protocol for the study of these infections. In 1982, the first three projects were supported. The two in India, in different locations, will examine the causes and outcome of these diseases in children and the information they provide should help develop effective means of treatment. A similar project was also launched in the Caribbean.

Under the leadership of the WHO's Expanded Programme for Immunization, increasing numbers of children are being vaccinated against childhood

diseases. The results of many of these programs are disappointing, however, and a number of immunized children are still contracting polio, measles, diphtheria, whooping cough, and other diseases. Studies have pointed to malnutrition as one of the causes for the failure of immunization. Preliminary findings from an IDRC-supported project in Colombia indicate that mildly malnourished children have a lower immune response when vaccinated against diphtheria, tetanus, and tuberculosis than well nourished children. A new study begun in 1982 will follow the same children for a further three years to determine the incidence and severity of diseases and see how this relates to their nutritional state.

Over the years, the division has supported several projects in different parts of the world to determine the causes and patterns of diarrheal diseases. Several projects are also developing and evaluating programs to promote the use of oral rehydration salts to treat children. Following a project in Southeast Asia, simple educational materials explaining to mothers the proper use of oral rehydration are now being disseminated in three countries. A second phase of the project will now evaluate the impact of the materials and prepare others for educating physicians and medical personnel. To solve the problem of the expensive packaging needed to protect the salts from moisture, a different formulation will also be tested.

In Trinidad, the success of oral rehydration therapy has been confirmed during the first phase of a project. A second phase was launched this year to expand the pilot program and launch an educational campaign.

Diarrheal diseases occur most frequently when infants are weaned from breast milk to other foods. Although the contamination of milk formulas has received considerable attention, little research has been carried out on weaning foods. Researchers in Peru are studying the relationship between diarrhea in infants and the foods they are fed.

The search for effective, inexpensive ways of bringing health care to rural populations also continued this year. In one province of the Philippines, mobile nursing clinics serve isolated populations. A grant was approved to enable researchers to assess how effective the clinics are. In Indonesia, nurses are being trained to meet the health needs of rural populations. Their training and effectiveness are now being evaluated.

The lack of trained personnel has been identified as a major constraint to the implementation of water-supply and sanitation programs. To help solve this problem in Indonesia, a project is being supported that will design, implement, and evaluate a training program for water-supply personnel working in rural areas of the country.

Villagers are being educated about the health hazards posed by poor sanitation and strategies are being developed to promote community participation in projects in Sénégal, Sierra Leone, and the Gambia. The impact of new latrines and wells will also be measured. In Indonesia, a new project will seek to examine the impact of sanitation on preventing parasitic infections.

In August, researchers involved in four Asian projects testing village hand-pumps met in Malaysia to review the results of their work. They concluded that the polyvinyl chloride (PVC) pumps could be manufactured locally and were efficient and easy to maintain. The results of these projects are presented in *Village Handpump Technology*, published late this year (see page 40).

Sexually transmitted diseases (STD) continue to spread unabated throughout the world. Little is known, however, about their incidence in developing countries where the lack of facilities for diagnosis and treatment makes the populations of these countries particularly vulnerable. New projects launched this year in Brazil, Jamaica, Nigeria, and Thailand will seek to develop effective treatments for the control of gonorrhea, one of the most common STDs.

Reflecting the growing industrialization of many developing countries, the number of occupational-health projects grew substantially this year. In Hong Kong and Indonesia, the incidence of *byssinosis*, a lung disorder associated with the textile industry, is being studied. In India, the health of coal miners is being assessed to recommend improvements in their working conditions. In the Sudan, the flour-milling industry is the focus of a project that will study the link between hypersensitivity to flour dust and respiratory diseases.

Two other projects are investigating accidents and injuries in a variety of Korean industries and in banana plantations in Honduras.



**The polyvinyl chloride pump: implementing critical water-supply and sanitation programs.**

## **Fertility: A Family Concern**

It took 35 years for the world's population to grow from two to four billion. Reaching six billion should take 25 years and, by the year 2000, the population of



developing countries alone will number 4.8 billion.

Despite dire Malthusian predictions, the rate of population growth in developing countries is slowing down, from 2.4 percent annually in 1965 to 2.2 percent today; probably due to education, improved health conditions that increase children's chances of survival, urbanization, and accrued employment opportunities.

The interrelationships between population growth and socioeconomic factors are exceedingly complex, especially because decisions about family size are not made by governments and large organizations, but by millions of individuals, motivated by often quite

that continuation rates for contraceptive users remain low. Fears about the safety of some contraceptive methods, or the inconvenience of use, lead many to abandon them. The improvement of existing fertility regulation methods and the development of new ones are therefore a priority.

Much of this work is carried out by the International Committee on Contraceptive Research (ICCR), a consortium of scientists formed in 1971. Through ICCR's activities, several new contraceptive methods have enjoyed wide distribution, including the Copper-T intrauterine device (IUD).

Now, after more than a decade of research, two new versions of the



**Decisions about family size are not made by governments, but by individuals.**

intangible factors. The role of governments is to promote improvements in living conditions that may motivate families to want fewer children, and to provide the means for them to make their choice effective.

During the past two decades, most developing countries have launched active family-planning programs to do just that, but not all have met with the hoped-for success. One of the reasons is

Copper-T are ready for distribution. Called the 380A and the 380Ag, their advantages are greater effectiveness and fewer side effects than other IUDs. IDRC, which has supported the work of the ICCR since 1974, this year approved a project to promote actively the introduction of these new devices in the countries where they are most needed.

Oral contraceptive pills rank among the most widely used of family-planning



methods. Recent studies, however, have pointed to a number of risks associated with long-term use. In an effort to reduce these risks, several countries are selecting low-dose products, carefully screening users, and educating both users and the staff of family-planning clinics. In Mexico, where pills are widely used, researchers are now carrying out a survey to determine the awareness of family-planning personnel to the possible problems, and to gauge their ability to screen patients effectively.

A more-recent contraceptive development is the long-term hormonal implant, Norplant. The division has supported acceptability studies of the implant in Ecuador, Indonesia, India, Egypt, and Thailand, as well as the development of educational materials for users and health personnel. In Indonesia, Norplant has proven effective and was well accepted by a sample of women. A wider trial involving 10 000 women was launched this year with a view to introducing the implant into the country's family-planning program.

An area neglected by researchers until recently has been the development of male contraceptives. One of the constraints in developing new male methods is the lack of understanding of the male reproductive system. Halting male fertility is biologically difficult: up to a billion sperm are produced daily and controlling or stopping this proliferation is difficult.

One approach to male contraception would be to alter the sperm's ability to fertilize the ovum, which could be done by inhibiting or preventing their maturation. A project in Thailand has indicated that there may be a factor in the epididymis — the set of long cord-like ducts immediately behind the testes — that maintains the sperm in a nonmobile state. The sperm become mobile as they leave the epididymis and this mobility is essential for fertilization to occur. If this quiescent factor, as it is being called, could be identified, it might provide the basis for a male contraceptive. A second phase of the research will enable

the researchers to pursue their investigations.

The maturation of spermatozoa is also being studied in Kenya where a new project is investigating the hypothesis that delaying the sperm in its passage through the epididymis would bring about a loss of fertility. A project in Chile is aimed at providing contraception by preventing the sperm from penetrating the ovum. The research focuses on the role of two enzymes that enable sperm to travel through the female reproductive tract and penetrate the ovum's protective barrier.

Although these and other projects deal specifically with contraceptive development, IDRC's fertility-regulation



**Breastfeeding: health and emotional benefits for both mother and child.**

program has become much broader in scope. A number of projects, for example, are looking at the oldest and possibly the most widely used means of contraception — breastfeeding.

The health and emotional benefits of breastfeeding for both mother and child are being increasingly recognized, but its contraceptive effect has been



neglected. Breastfeeding prevents fertility after childbirth as the stimulation of the baby's suckling promotes the secretion of hormones that delay the return of ovulation. This infertility, called lactational amenorrhea, is still little understood and varies widely from woman to woman. Researchers in Mexico, for example, noted that it lasted up to 10 months in urban areas and up to two years in rural areas. They are now studying the relationship between breastfeeding patterns and amenorrhea. A similar project in Egypt determined that the length and intensity of the breastfeeding period affected the duration of amenorrhea.

Because breastfeeding is not a reliable long-term contraceptive, however, many new mothers turn to other forms of contraception, some of which interfere with lactation and are of doubtful safety for the child. Researchers in Chile have found that natural progesterone pellets do not affect lactation and are both effective and safe. The research is now continuing to improve the pellets and develop other means of administering the hormone.

The program has expanded in recent years to include what could be called "social obstetrics" — studies that aim to improve the health of mother and child during pregnancy and after childbirth.

This past year, two new projects were launched. In Brazil, researchers are looking at the cause of illness and death in babies during the last stages of pregnancy and immediately after birth. In Malaysia, the research is focused on the health care of the mother-to-be. These projects should help planners develop effective maternal- and child-health services.

Both women and babies are at greatest risk from sexually transmitted diseases (STDs). Gonorrhea, for instance, results in pelvic inflammatory disease in 20 percent of infected, untreated women. Sterility, ill health, and ectopic pregnancy are frequent consequences. Children born to a woman with gonorrhea may develop serious eye infections, sometimes leading to blindness.

Control of gonorrhea as well as other common STDs in developing countries is hindered by a lack of facilities and personnel for diagnosis and treatment. As mentioned earlier, the division has been supporting research to provide epidemiological data and develop effective treatments for STDs in Latin America and Africa.

## Information Sciences Program

About four years ago in Argentina, a major United Nations conference on technological cooperation among developing nations advocated the sharing of information as a means of promoting development. By doing so, countries could avoid the duplication of effort and the wastage of scarce human, and even scarcer financial, resources.

Helping policymakers and scientists in developing countries in this task through the establishment of better information systems and services for the collection and processing of information is the mandate of IDRC's Information Sciences Division.

The division is guided by the belief that the world's volume of new scientific literature is too enormous for any one country to build an independent, all-encompassing information system. Equally, the most important information for a country is that produced within its own boundaries or selected for relevance to its own needs.

A large part of the division's efforts has been directed toward the building of cooperative bibliographic systems and services. To reflect changing needs and technologies, however, it now supports activities in such areas as computer conferencing, the development of computer software for research applications, and a variety of means of disseminating research results.

Underlying the division's efforts with more visible aspects of information sharing, that is hardware and software, is a concern with social issues. For instance, in the past year, there has been much interest in improving services related to public administration — the civil service function in various levels of government and in state enterprises.

Another example is "women's issues." The division participated at a major international conference in Montreal in 1982, where the need for appropriate information programs on this issue was identified. The division is

now keenly awaiting the identification of the institutions that will be responsible for these programs, and the direction that they will take.

The division's main areas of concentration include:

- Support for international cooperative information systems in which developing countries can participate, contribute, and benefit;
- Support for specialized information analysis centres dealing with specific topics of importance to development efforts;
- Library development and the operation of IDRC's own library, information, and micrographics services;



**Information: underlying the hardware and software is a concern with social issues.**

- Computer science, particularly the application of data-base management systems for the storage and retrieval of information;
- Promotion of compatible information-processing methods so that information can be shared readily;
- Extension services, especially for small-scale industries;



- Cartography, in particular the use of satellite data to produce thematic maps; and
- Application of improved telecommunications to facilitate information exchange among developing countries.

In its support of information projects in the fields of agriculture, health, population, education, and economic planning, the division is very conscious of the work of the Centre's other program divisions.

In 1982, 21 new projects were initiated by the division, in addition to those managed within IDRC as continuing activities. The projects approved totaled \$4.15 million, or some 10 percent of the Centre's project budget.

John E. Woolston has been director of the division since its inception.

**The Year in Review** — "Knowledge is power," wrote Francis Bacon close to four centuries ago and this is increasingly true as vast resources are expended each year on collecting information on research and development. It is difficult, however, for the many developing countries that lack human, technical, and financial resources to tap into the world's pool of information.

To assist developing countries, the Information Sciences Division has stressed making "information for development" available through the support of international cooperative information systems in which all members contribute the information produced on their territory, and share equally in the total.

The best known of these systems is probably AGRIS, the International Information System for Agricultural Sciences and Technology, coordinated by the Food and Agriculture Organization of the United Nations (FAO). Centres participating in AGRIS may do so individually or may concentrate their efforts and resources by acting through regional centres. In Latin America, the AGRINTER network — Sistema Interamericano de Información para las Ciencias Agrícolas — based in San José, Costa Rica, carries out this function.

Support for AGRINTER continued in 1982 with funding for the implementation and operation of computerized systems at institutions in five countries, thus increasing access to the AGRIS and AGRINTER data bases for agricultural research in Latin America.

Where there is no regional centre or network, national efforts need to be supported and reinforced. In Jordan, for example, a poor infrastructure for information was identified as a constraint to increasing agricultural production. This information gap should now be narrowed with the establishment of a new system to organize national agricultural literature and to facilitate participation in AGRIS.

Also in agriculture, a project was funded this year in Kenya to test a computer package designed to help researchers get the most out of agroforestry projects. Called MULBUD (multi-crop, multi-period budgeting), the microcomputer software package can be used to formulate and evaluate cropping plans.

In the mid-1970s, IDRC took the lead in the field of socioeconomic information by designing a global system known as DEVSIS, the Development Sciences Information System. DEVSIS has not been implemented on a global scale, but a number of important development information systems have been launched. The most significant were set up by the UN Regional Economic Commissions: INFOPLAN, the Information System for Planning in Latin America; CARISPLAN in the Caribbean; and PADIS-DEV, the economic and social component of the Pan-African Documentation and Information System in Africa. PADIS-DEV entered a second phase this year to train member countries wishing to participate in the Pan-African network. At the national level, a project in Guinea will help improve the documentary infrastructure by training staff and setting up the national coordination centre as an affiliate of PADIS.

IDRC itself has operated an experimental DEVSIS program since 1976, identifying appropriate documents in

Canada and receiving inputs from a number of countries. Participants from the UN Regional Economic Commissions met in 1981 to discuss actions that would support their activities and lead to effective exchange of data. One of their recommendations was to accept an offer from IDRC to produce a model manual detailing the methods to be used in DEVSIS-type systems. The resulting *Manual for the Preparation of Records in Development-Information Systems* was published this year (see page 40).

The division's efforts to strengthen national institutions participating in regional programs also continued this year. In Brazil, a grant has enabled the state of São Paulo to obtain the methodology and software needed to establish a population-documentation centre, linked to the Latin American regional population information system, DOCPAL. The project has already resulted in the publication of the first issue of the Brazilian population index, DOCPOP.

Building cooperative information systems across national boundaries entails a significant effort in organization and training. It makes sense only when the topic covered is broad — "agriculture" and "population" for example. However, what is often needed is more narrowly focused information, tailored in response to an inquiry, in the client's own language. Such services require close collaboration between scientists and information specialists.

Over the years, IDRC has made grants to a number of such specialized information analysis centres, on topics as varied as cassava, ferrocement, water buffaloes, and rural youth programs. All are located in centres of excellence in their field. Two new centres were created this year. The Bananas and Plantains Information Centre (BAPIC) in Panama will be the fifth centre dealing with a specific crop. Through the two-year project, the Union of Banana Exporting Countries will expand its documentation and information services to serve the needs of all producing countries.

Through the establishment of the International Centre for Diarrhoeal

Disease Research in Bangladesh (ICDDR,B), the Diarrhoeal Disease Information Service and Documentation Centre (DISC) will attempt to bridge the information gap that exists in this critical area of health research. The new centre will focus initially on Asia, and will assist researchers and practitioners through a variety of services including bibliographies, newsletters, a question-and-answer service, and a directory of personnel.

A small documentation centre on food and nutrition in Africa was also supported in Sénégal, and the Environmental Sanitation Information Center in Bangkok began a second phase of activity.



**Bananas and plantains: creating an information centre for a specific crop.**

In October, representatives of a dozen specialized information centres supported by IDRC met in Ottawa to identify common problems and make recommendations to donors. Among their main



concerns was the problem of funding. Many felt that the time-fixed grants provided by donors hindered efficient management. If the funds were provided in the form of an endowment, without time limit, they would be able to husband them, spreading their application over a longer period, thus escaping from the recurring spectre of what to do when the project ends. The division is studying their recommendations.

A project for the development of an infrastructure was approved at the Ministry of Information in Barbados. The objective is to enable it to implement a new model for a national information system to organize the country's libraries and information centres into the Barbados Library, Archive and Information Centre Network, BLAIN. In Costa Rica, a feasibility study on the establishment of an information system for export promotion was launched. And to help improve China's science and technology information services, a management course for senior personnel was funded at the Institute of Scientific and Technical Information.

The network of IDRC-supported thematic mapping projects was extended this year to Kenya where the Regional Centre for Services in Surveying and Mapping will initiate a photo-mapping project for the benefit of eastern and southern African countries. Like other similar projects described in *Remote Sensing and Development*, published this year (see page 39), it will use data provided by remote-sensing satellites.

Also in East Africa, a new project developed in cooperation with IDRC's Communications Division will provide technical support to three research organizations to help them plan and implement publications programs for the dissemination of their research results.

The Information Sciences program differs from those of the other divisions in that, in addition to project activity, it also funds and manages a number of in-Centre projects such as IDRC's library. The library acts as a major resource for Centre staff and for development

scholars in Canada. Some 50 institutions across Canada now have computer access to the library's data bases. Some of these data bases have been developed by in-Centre projects such as SALUS, a bibliography with abstracts on low-cost rural health-care delivery.

Many of the requests received by the division are not for funding but for professional advice, training in the establishment of systems, computer software, and preparation of operating manuals. Very often the requests are for the time of division staff. In view of these increasing demands, a "Systems and Methods" group has been established to provide a pool of experienced personnel to fill these requests. This group will help identify mechanisms by which libraries can better cooperate with each other and work on the development of nonbibliographic software. It may also provide assistance in the area of computer conferencing. Following a workshop held in Ottawa in 1981 (see page 39), growing interest is being expressed in the use of digital telecommunications as a development tool.

Division staff also spend a good deal of time responding to the needs of users of MINISIS, the Interactive Minicomputer System for Information Retrieval and Library Management, the software package that was developed by the Centre for the management of data bases. Of the close-to-60 MINISIS users, two-thirds are in developing countries.

To assist countries and institutions for whom minicomputers are too expensive or who do not have access to the Hewlett-Packard hardware needed to run MINISIS, a new in-Centre project was approved this year to develop a package of information management software for use on microcomputers. Systems analysts from two institutions in developing countries are participating in the development of the system using microcomputers manufactured in their own countries.

## Making a Good Idea Better

It seemed like a good idea at the time: to develop an efficient information-management system for use on a minicomputer. The time was 1976 and the information explosion required the use of computers simply to cope with the volume of new information being created. For most developing countries, however, the high cost of computers and programs meant that these systems were beyond their means.

The work took two IDRC systems analysts two years, and the end result was MINISIS — so named for "mini" computer and ISIS, the parent system (Integrated Set of Information Systems) developed by the International Labour Office (ILO) for full-sized computers. In the years that have followed MINISIS' implementation, the idea has proven itself over and over again.

A low-cost versatile package, MINISIS operates on the Hewlett-Packard 3000 family of minicomputers. It lends itself to many different applications, including library management functions. Its popularity has extended far beyond the people it was originally intended to serve — the IDRC library and institutions in developing countries — to reach industrialized-country governments and institutions, from sports-coaching associations in Canada to food industries in Switzerland. The ILO itself has replaced ISIS with its offspring.

There are currently some 60 members in the MINISIS family of users around the world and the program has become a key component of some global, regional, and national information networks. Some examples are: the UN Regional Economic Commission for Africa is collecting documents relevant to social and economic development; the Information Services Unit of the UN Department of Economic and Social Affairs is collecting and merging data from the Regional Economic Commissions; and the Centre national de documentation in Morocco is establishing a national network for document collection. There are five installations in Beijing, China, and the

FAO has chosen MINISIS for four installations in Southeast Asia for its aquaculture development program.

MINISIS' versatility and flexibility are the key to its success. Equally important, it is — in computer jargon — "user friendly," that is, easy to learn even for those with little or no experience of computerized information systems.

Until recently, however, MINISIS was user friendly only if the user spoke and wrote a language based on the Roman alphabet, preferably English or French. As Faye Daneliuk and Richard Lee, who designed MINISIS explain: "Considerable dissatisfaction arose against the computer manufacturers in the Western World because computers were oriented towards the Roman alphabet and, in fact, the English language. In those countries in which the loudest concern was expressed, computers were being used by those educated in the West, in the English tongue."

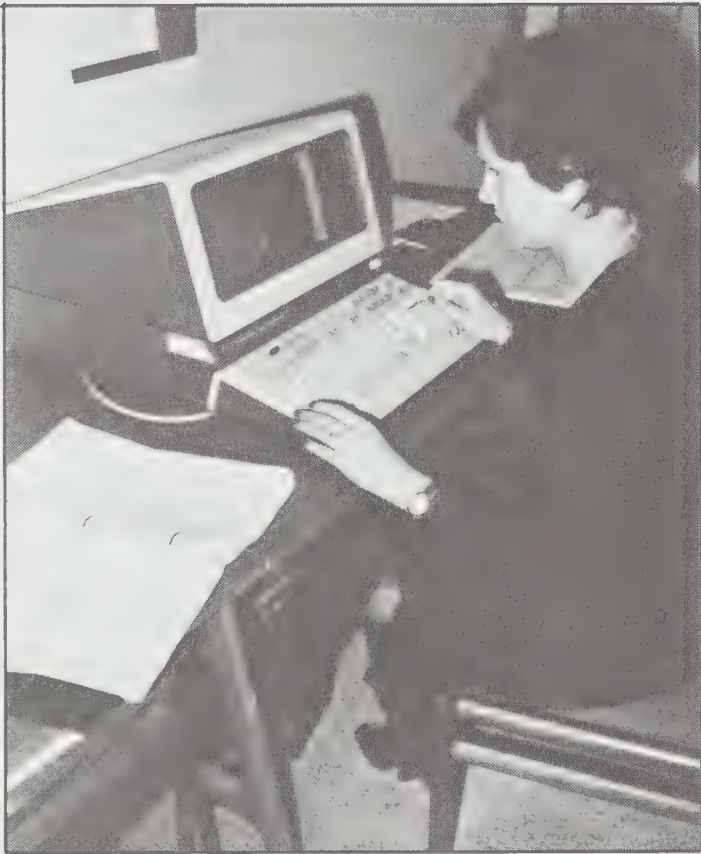
Indeed, the lack of tools in languages such as Arabic, Thai, and Korean is a factor limiting the achievements of many Third World scientists. To have access to information, and to contribute their findings, these scientists must learn not only a second language, but also a second alphabet. Those who fail to do so cannot have access to computers.

"There have been few software tools developed with an international audience in mind," says Charles Godfrey, Associate Director of IDRC's Information Sciences Division. "The IDRC philosophy recognizes that it is important to adapt tools to the environment in which they are used. And language is part of that environment."

In 1980, the Arab League was automating the socioeconomic information services that it provides to its members. It identified MINISIS as an appropriate system for carrying out the work, but needed to be able to process Arabic, in the Arabic script. Computer terminals that support Arabic script were available, but software was not. IDRC took up the challenge.

The first problem, explains Richard Lee, head of MINISIS Future Systems,





**MINISIS in Tunisia: few software tools were developed for an international audience.**

was that of lexicography — the order in which symbols are ordered, as in a dictionary. When a sequence or order exists, the computer can be used to sort sets of data. But Arabic has two systems in use: the Arab League had first to decide on the use of only one.

Designing a coding scheme for the characters themselves, and a system for letting the computer know which script — Roman or Arabic — was being used,

took two years. The work was carried out in close collaboration with the Arab League.

The system was installed at the Arab League headquarters in Tunis this year. The League itself is responsible for translating the "commands" — the instructions given to the computer — into Arabic.

The alternate character-set capability developed will not only handle Arabic, says Lee. "It's a general solution that can store and retrieve any non-Roman script character set — up to 16 of them simultaneously — as long as the number of characters in the set does not exceed 128 and can be displayed horizontally. The Roman alphabet, for example, has 26 letters, in upper and lower case, plus numbers, punctuation marks, and some special symbols. It is read horizontally, left to right." Discussions are under way for adapting the system to Korean and Thai as well as some Indian languages.

The Arab League member organizations are now forming an information network and all will use the same tools. The MINISIS system has been installed at six locations and discussions are under way for a further six installations. The Arab League itself is providing support and training to members in the use of MINISIS.

The new MINISIS package — Version E — has been issued to all users. The user group, which includes all developing country and international organizations to whom IDRC has provided the package, as well as the distributors who handle sales in industrialized countries and to commercial enterprises in developing countries, meets annually to exchange information. "It is somewhat unique in user groups," notes Godfrey. "What we see happening is a mix of institutions dealing with one another on an equal footing, sharing their experiences, with a growing participation by developing-country users. This wouldn't be possible in a commercial atmosphere."

## Social Sciences Program

Many middle-income developing countries have begun the transition from an agrarian to an industrial economy. This critical phase in their socio-economic evolution means a new configuration of development problems and priorities. The lower-income countries that have not yet seen a decline in their agricultural labour force could benefit from a close study and observation of the path followed by their more-developed counterparts.

In the broadest terms, the mandate of IDRC's Social Sciences Division is to help societies gain, through applied research, a better understanding of the complexities of development processes. Such understanding means that problems and solutions are more clearly identified, and effective policies to deal with them more clearly articulated.

The division's program and the increase in the number of its projects in the last few years reflect the importance of social and economic research to the development process. The division has diversified its approach to the funding of research and training in recent years, placing emphasis on areas where research environments are fragile and institutions untested. Workshops, study tours, and training, as well as project funding, are intended to support and strengthen research capability. Increasing attention is also being paid to the development of research capacity in the more remote countries, and in under-privileged areas within countries. Larger projects are supported in areas of greater institutional strength.

In 1982, 114 projects were initiated, totaling some \$10.3 million. Operationally, the division is the second largest of the Centre's program divisions, accounting for close to 25 percent of the total project budget.

The division's program is focused on six main areas:

- Economics and rural modernization: Economic policies and their impact on development, agricultural

development, impact studies, labour supply and employment, and regional development studies are all stressed.

- Science and technology policy: Issues studied include national technology choices, effects of technical change, diffusion of technology, and markets for technology as they relate both to industrialization and to rural development.
- Population and development: Understanding and solving population problems is the main thrust. Studies include the development of training materials and programs, research into the determinants of fertility and mortality, population movements, and evaluations of population policies and programs. A new subprogram focuses on the rural poor.
- Energy policy: The focus is on methodologies to assess current energy consumption patterns and needs, and the cost effectiveness of alternatives, particularly in the rural areas of developing countries.
- Urban policies: Improving service delivery to the urban poor, evaluating low-cost markets, urban land, informal employment, and development policies are the major components of this program.
- Education: The program concentrates on the basic cycle of education and the relationship between education and work, and the encouragement and utilization of educational research.

The division also supports the activities of national, regional, and international social sciences organizations, thus strengthening research infrastructures and providing training and research opportunities for young scholars.

David W. Steedman was appointed director of the Social Sciences Division in 1978.

**The Year in Review** — Rural development programs have helped overcome obstacles to increased agricultural production and have benefited the poor in many areas. In other regions, however, little progress has been made. The



result is a stagnant, or declining, agricultural output, higher food prices, and increased malnutrition.

In the past few years, the harsh economic climate has also taken its toll. In Peru, for example, inflation rose to 68 percent by 1970 and was accompanied by a sharp recession. One of the causes of Peru's economic woes has been hypothesized to be the stagnation of the agricultural sector. The accompanying rapid population growth has meant that the price of agricultural goods has increased. Because of their reduced purchasing power, lower-income groups are most seriously affected.

A project funded this year will study the relationship between agriculture, food, and inflation in Peru and the impact of inflation on the peasant economy. The impact of inflation is also being studied in Argentina where far-reaching financial reforms, enacted in 1977, liberalized the country's financial market. The findings should assist Argentina and other developing countries to understand better the performance of financial markets vis-à-vis different regulations and interventions.

In Kenya, the structural readjustment of the economy is being studied to help the Ministry of Planning and Development formulate long-term strategies and establish a framework for the 1984–1988 development plan. A similar macro-economic study was also launched in Brazil this year.

In many African countries, food production has not kept pace with demand. The need for food imports increased at the same time as earnings from agricultural exports decreased creating serious balance-of-payments problems. The question is not only how to increase production, but also how to transform the rural economy to provide opportunities for people to participate in agricultural production and rural development.

Projects were launched this year in Zaire to better understand the constraints of rice farmers and examine the systems of food production and marketing in the Bandundu region. Dairy

marketing is also being studied in Zimbabwe. In Tanzania, the systems of production and marketing of oilseeds are being examined to recommend ways of increasing export earnings.

Fisheries are an important component of the economies of many developing countries. In Zambia, the Lake Kafue fisheries have been successful in expanding food supplies and providing incomes. Because it is one of the few dynamic, growing areas of production in the country, it is now being studied to better understand the economic and technological operations of the fisheries and to recommend policy changes to foster their development. In Costa Rica, the development of fisheries and



**Harsh times: studying the need to readjust economic structures.**

aquaculture are key economic priorities. Although fish supply has increased in recent years, the full potential has not yet been realized. The impact of government policies is now being analyzed to identify programs for the development of the country's marine resources. In Malaysia, a project will develop a



research program in fisheries economies to assist policymakers charged with the development of this sector.

High unemployment and low foreign-exchange reserves are dual problems within the Indian economy. Until recently, the government has been committed to a policy of import substitution, but this policy does not generate foreign exchange. A project launched this year will examine the relationship between exports and employment creation in the handicrafts, leather, and tourism industries. The policies affecting these industries will also be studied to recommend improvements.

Exports are also the target of a project in Nicaragua. By identifying nontraditional agricultural products for export, the research aims to help generate foreign exchange and assist in planning the country's agricultural development.

The demographic impact of development efforts continues to be a focus of the division's population and development research program. Grants were approved this year for projects in Mexico and Zambia to study differences between families engaged in different types of agricultural production. The reverse — the impact of population on development efforts — is being studied in Colombia and Argentina.

Child mortality levels are an important indicator of a country's socioeconomic development. In Argentina, however, infant death rates remain high despite a relatively advanced level of development. To find out why, researchers are examining the causes and levels of child illness and death in the city of Rosario. Chilean researchers are concerned with the other side of the coin: finding out why infant mortality has declined dramatically despite deteriorating socioeconomic conditions.

In Bangladesh, a methodology for measuring the conditions that contribute to illness and death from diarrheal diseases will be tested. Projects were also approved to study how the family structure influences young couples' decisions about contraceptive use and to analyze

the effectiveness of various types of family-planning programs.

Population movements are increasing in developing countries as more farm families migrate to the city in search of a better life. The problems posed by rapid urbanization have now become a priority in many countries. In Quito, Ecuador, and in Nigerian cities, land and housing for the urban poor are in short supply. New projects seek to formulate recommendations for alleviating this shortage. In Abidjan, Ivory Coast, researchers are now assessing the effectiveness of a recently implemented low-cost program.

The provision of other urban services, such as waste disposal systems, is also



**Retail food markets: providing low-cost urban services.**

being studied in Korea and the Sudan. In Bangkok and Manila, retail food markets serving the poor are being examined.

Employment is a crucial need in the expanding cities. Grants were approved this year for three projects — in Togo, Colombia, and Ecuador — that are examining the importance of the informal manufacturing sector in providing employment.

The division's education program supports research into education at all levels, from child-to-child training within the home in Colombia to



evaluations of teacher-training institutes in Liberia and Colombia. In Chile, as in many developing countries, many children of poor families do not finish primary school. Two new projects are analyzing teachers' attitudes and other factors within the school system that may contribute to the success or failure of pupils.

Innovative methods of dispensing mass primary education are also a focus of the education program. In the Philippines, an evaluation began this year of a program that combines education with rural development — the People's Schools.

The quality of education, particularly in the sciences, has been questioned in a number of countries. In the Dominican Republic and Kenya, the teaching of mathematics and biology respectively is being examined. The role of schools in transmitting values to adolescents in Morocco is also being evaluated.

Much education is not acquired in schools but through nonformal means such as the mass media. In Peru, radio is a significant means of communication, reaching isolated, illiterate farmers in their own language. The range of radio programming aimed at rural populations is being documented in a new project. Other projects are examining participation of the mass media and the role of television in development.

Policymakers in developing countries face unenviable choices. The slowdown in international trade has constrained their growth, in turn limiting investment. The balance-of-payments crisis many of them face means few financial resources are available for development programs. The projects supported through the science and technology policy program reflect to a large extent the changes in the world economy. They also testify to a growing awareness that technology choices are crucial for development. During the past year, grants were approved for projects ranging from studies of spinning and weaving techniques in Bangladesh to the impact of national development banks on the acquisition

of technology in four countries.

Energy policy research has been expanded this year and now forms a subprogram within the science and technology policy program. Close attention is being paid to the search for energy systems, the construction of an infrastructure, and the initiation of a research base so that developing countries can better control this important sector. Projects approved this year include: a review of rural energy surveys in India to improve research methods; a study of food and fuel production in Kenyan cities; and a review of energy planning in Latin America.

## Studying the Future Today

"Science and technology policy is not a discipline," says Tony Tillett, an associate director in the Social Sciences Division, "it's a set of problems." In the drive for development and industrialization, developing countries face difficult choices: Large- or small-scale production? Efficiency versus employment? Traditional or modern technologies? How are they acquired? At what cost? What are their effect on people? How are people to be trained? "Nobody has the answers," he says, "and anyway, the answers keep changing."

Science and technology policy is comprised of three "moving targets," says Tillett. Each is a separate field — complex, fragmented, and specialized. What is essential for developing countries is to have a group of people who understand how science and technology work, and what their effects will be.

That is the goal of IDRC's science and technology policy program: to add to the body of knowledge on how science and technology contribute to development. This knowledge should lead to better decisions and policies and benefit not only government policymakers, but also those who use technology — factory managers, farmers, urban decision-makers, and peasants. Begun in 1972, the program has supported some 70 projects dealing with technology policy

for both industrial requirements and the needs of rural areas.

An interdisciplinary approach has been essential. Effective policies must be based on accurate information and an understanding of the issues facing the producer and the consumer.

The program is concerned with technology policy at all levels, from the traditional rural technologies to the most sophisticated. At the simplest level, a network of projects in Latin America is asking how peasant societies survive when under pressure from a technology they neither understand nor participate in.

In Paraguay, for example, small farmers are being displaced by the swift expansion of commercial agriculture. High population growth and lack of new lands are reducing the average farm size. If the small farmers are to survive, they must change their farming methods: to do so will require improving their technology. Researchers are now surveying conditions of peasant farms, particularly their use of technology, to find ways of using available technologies more efficiently.

As Chris Smart, program officer for science and technology policy, explains, "The peasant has a technology that has been denigrated. The challenge is to find how to build on what peasants have already so they can maintain themselves under pressure."

In Peru, an appropriate technology group, the Talpuy Grupo de Investigación y Extensión de Tecnología Popular (TGIETP) has been promoting knowledge about technologies currently used by peasants because many of these technologies are known to only a few. TGIETP has thus been working at disseminating this information through publications and demonstrations. IDRC is funding an evaluation of this rural technology extension work.

In Colombia, an experimental rural university is training students for rural development activities, particularly in agricultural extension. A project is now evaluating and further developing the approach and the technologies being

experimented upon. In 1982, a project was funded to enable the Fundación para la Aplicación y la Enseñanza de las Ciencias in Cali, Colombia, to organize a network of centres undertaking research in this area.

At the other end of the technological scale are sophisticated technologies such as microelectronics. There is a growing concern in developing countries that technological developments based on the silicon chip will alter and possibly destroy their manufacturing capacity. Many realize that their future may depend on investment in this field, and several newly industrialized countries, such as Mexico and Brazil, have industries devoted to microelectronics.



**High technology: will the silicon chip destroy manufacturing capacity of developing countries?**

For many countries that now provide manufacturing labour, the problem is one of competition. With the increase of manufacturing by microelectronic means — robotics — in industrialized countries, developing countries are losing their competitive advantage, that of supplying cheap labour. An important question is: what will microelectronics do to their economic health? Some are also beginning to ask what microelectronics can do for them, as well as to them. The science and technology policy program has been actively studying this area and a network of projects is expected to begin in 1983.

The radical shifts in technology now taking place are obviously affecting



employment. Higher skills levels are essential for the development of industries and technology-based occupations. Rapid technology change alters these requirements so that people either do not realize their full potential, or become progressively "de-skilled." Increasing attention is being focused worldwide on the need to make significant changes in educational planning and labour-force development to take account of these changes.

Research in this area — technology, education, employment, and development (TEED) — is being developed jointly with the division's education program. A number of projects are already being carried out. In Brazil, for instance, a study of the effect of new equipment in the textile industry concluded that workers needed fewer skills to handle the new machines. In Thailand, a study of skilled-labour needs for the next 10 years is being carried out.

In 1977, the division began to support a program of science and technology policy training at the Science Policy Research Unit of the University of Sussex in England, where an IDRC program officer is based. Following on that work, a program of four major technology policy workshops began this year to introduce technology issues to policymakers in Africa and the Caribbean. Each month-long workshop is intended to stimulate the interest of researchers in

technology policy-related fields and to foster links between policymakers and researchers. Says one of the project organizers: "The workshops have provided many of the participants with their first visit to the factory floor."

Other activities supported through the science and technology program include studies of resource-allocation policies for science and technology. This year, projects were funded in Latin America and Indonesia to analyze the generation and adoption of agricultural technologies.

The effects of new information technology on communications systems are also being studied. One project funded this year, for example, is examining the current and potential use of computer conferencing for scientific exchanges in Mexico and Brazil and is examining the laws that pertain to computer-based data flows. Program Officer Eva Rathgeber is responsible for projects in this field.

Underlying the program's activities is the certainty that developing countries will eventually have to make decisions about technology. "We believe it's better to make those decisions with information," says Tillett. "We are trying to help developing countries look at technological problems in the future. It's essential that they understand how things work."

To help them do so, the unit has assembled an international, multidisciplinary team of researchers on science and technology policy.

## Cooperative Programs

Global research and development activities are now a \$150-billion enterprise, employing some three million scientists and engineers. It can hardly be called global, however, for the developing countries spend only about three percent of this amount and employ just 13 percent of the scientists and engineers.

This disparity led developing countries at the UN Conference on Science and Technology for Development, held in Vienna in 1979, to ask for greater access to research. Canada's response was the creation of a new program, administered by IDRC, that would enable developing countries to share in Canadian research and development expertise. IDRC's Cooperative Programs Unit was launched in 1980.

The main orientation of the program is to promote collaboration between research groups in developing countries and their counterparts in Canada, whether in academic, governmental, or private sectors. By providing opportunities to work with Canadian institutions, the program will strengthen the scientific and technological capacity in the participating institutions in the Third World. The creation of such channels of communication among scientists is intended to improve the transfer of research results to researchers in developing countries, and the experience gained by the Canadian scientists should lead to a greater concern for the problems of developing countries.

In its first year of activity, the unit supported 10 projects. The substantial increase in the unit's budget in 1982, its second year of activity, enabled it to support 14 new projects, with grants totaling some \$1.8 million.

The unit's mandate is broad: the research it supports can be in any field clearly related to the economic and social development of Third World countries and in which there is a recognized Canadian expertise.

Many of the projects supported from the Cooperative Programs budget complement the ongoing work of the

Centre's four program divisions and are managed by them. The unit also began this year to develop an area of specialty, earth sciences, not covered by the program divisions. A series of consultations was held in developing countries and Canada this year to help define the focus of the new program.

The director of Cooperative Programs, James Mullin, was appointed in 1981.

**The Year in Review** — Research and development priorities in developing countries often mirror those in the industrialized world: the breeding of better crop varieties, finding new energy sources, and preventing environmental pollution are a few examples. Thus, although the conditions in which research results are to be applied differ, the process of research and of developing the new technologies is basically the same. Therefore, expertise gained in one environment can often be applied to a quite different locale.

Channeling some of the scientific and technological expertise resident in the Canadian scientific community to the solution of problems in developing countries is the *raison d'être* of the Cooperative Programs Unit. In doing so, it adds a new dimension to IDRC's project capability. And, because of its broad terms of reference — to support any research clearly related to economic or social development of Third World countries — it can support projects that do not fall within the mandate of the Centre's four program divisions.

During 1982, about half of the grants appropriated by the Cooperative Programs Unit were in support of projects that fell within the areas of concentration of the Centre's program divisions, but which called for strong links to be established between researchers in the developing country and Canada.

Through the AFNS Division, for example, IDRC has supported a considerable amount of research on the improvement of food legume crops in developing countries. These crops boast a high protein content and the ability to produce well in nitrogen-deficient soils,



qualities that depend on the efficiency of nitrogen-fixing bacteria, rhizobia, associated with their roots.

Often, the crop-specific rhizobium must be introduced into the soil with the seeds. Most developing countries therefore import rhizobium inoculum from industrialized countries. The University of Manitoba has been investigating nitrogen-fixation for a number of years and recently has been selecting cold-tolerant rhizobium strains. Meanwhile, the International Center for Agricultural Research in the Dry Areas (ICARDA) in Syria has found that chickpeas can be grown as a winter crop with a large increase in yields — but a cold-tolerant rhizobium inoculant was required. The



**Legumes fix their own nitrogen and boast a high protein content.**

two institutions are now collaborating on the development of systems that could be used by small farmers for adding the rhizobium to the soil. The same institutions also launched the second phase of a project to develop varieties of faba beans resistant to common diseases.

Researchers from Memorial University in Newfoundland and the South Pacific Commission in New Caledonia also completed the first phase of a project to develop a biological control program for

mosquitoes in the small country of Tuvalu. After the successful trial of a bacterium and a nematode against mosquito larvae and the introduction of an education campaign, the project is continuing to launch an integrated program that the researchers hope will reduce mosquito populations sufficiently to stop the spread of diseases.

New cooperative projects administered by the Social Sciences Division include a project by the Institut d'économie quantitative of Tunisia and the Centre de recherche pour le développement économique of the Université de Montréal to develop an economic strategy for Tunisia. Also in Tunisia, the causes of fertility decline in recent years are being studied to recommend improvements to the country's population policies.

In the information field, a new project seeks to strengthen data-processing and statistical services at the Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT) in Mexico.

The second thrust of the Cooperative Programs Unit is support for research ventures in areas not supported by IDRC's program divisions. During 1982, these included the development of methods of identifying the sources of pollution of Trinidad's Caroni River, an analysis of freight transportation systems in Brazil, and a study related to the reintroduction of cooperatives in Tanzania.

## Coming Down to Earth

In the 1950s, geologists knew that ocean basins were deep and floored with heavy rocks . . . and that was about all. Then came the revolution. The theory of plate tectonics did for geology what relativity did for physics: it tersely explained a wealth of observations.

Suddenly, continents and oceans once thought of as fixed were seen to ride the rigid slabs into which the earth's shell is broken. Where they collide, the crust crumples and mountains rise. The ocean floor is formed as molten lava rises to fill



the fissures left as the plates move apart from one another.

Learning just what lay at the bottom of the ocean floor would prove difficult and expensive, however, requiring submersible craft and drill ships: except in Cyprus.

Cyprus' Troodos massif — 3000 square kilometres of rock — is in fact a piece of the ocean floor marooned on dry land. Here, an international team of earth scientists, the Crustal Research Drilling Group, has launched a large project that will, for the first time, yield a complete vertical section of the ocean floor.

The drilling project will provide significant new evidence on the formation and evolution of the oceanic crust. It will also have practical applications: it might suggest underground sources of water for parched Cyprus, for example, or lead to new mineral exploration techniques.

Because a number of countries have areas with a strong geological similarity to the Troodos massif, IDRC supported a collaborative project between Dalhousie University and the Cyprus Geological Survey to enable geologists from a number of developing countries to join the project as trainees and collaborators. The Cyprus Crustal Study project exposes these scientists to state-of-the-art knowledge and interpretation of important areas of ocean-crust geology, hydrogeology, and drilling technology. The experience will assist them in the identification of ore deposits, sources of geothermal energy, and groundwater resources in their home countries.

This was the first venture supported by the Cooperative Programs in the area of earth sciences, specifically into resource assessment. A second project was also supported in 1982 to interpret aeromagnetic survey coverage of Nigeria to understand the country's crustal structure. Being carried out by the University of Manitoba and Ahmadu Bello University in Nigeria, the project will contribute to mineral and resource development.

Resource development is only one thrust of the new earth sciences program, which is intended to support

research on all aspects of geology of the near-surface rocks. The Cooperative Programs Unit is expecting projects to develop in such areas as the identification of local rock-fertilizer sources, the location and development of groundwater resources (including studies of soil-water interactions that contribute to water purity). The development of appropriate small-scale techniques for extracting clays for ceramics and stone for construction are other possibilities.

Geotechnical research will also form a component of the program. Bangkok, for example, is sinking because of the depletion of groundwater. As a result, its famous canals are drying up, only to flood with every heavy rain. A number of



Depletion of groundwater in Bangkok: geotechnical research.

Third World cities face similar predicaments. Developing countries could benefit from a better understanding of this and other hazards — such as seismic activity, desertification, erosion, and the silting of harbours.

As with all projects supported by IDRC's program divisions, these are all intended to encourage research that addresses the basic needs of developing countries while strengthening their research capacities.



### Office of Planning and Evaluation

At the UN Conference on New and Renewable Sources of Energy held in Nairobi in 1981, Canada's Prime Minister, Pierre Trudeau, announced that \$10 million would be made available over four years to IDRC to support energy research related to developing countries. The first installment of the new grant was received in April 1982.

That month, the Centre hosted the first meeting of major funding agencies in the world to exchange information and develop a more responsive approach to funding energy research. The agencies agreed that coordination was needed to avoid the existing duplication of effort and a number of neglected areas were identified for further research. Subsequently, the first project — undertaken jointly with a major financing agency, the International Bank for Reconstruction and Development — was started in Haiti where soil erosion and lack of tree-planting programs have led to a severe shortage of fuelwood.

The most significant single new energy project launched in 1982, however, was the creation of an international advisory group composed of eminent researchers and policymakers from developing countries. This Energy Research Group (ERG) will review energy research needs, priorities, and resources.

To guide the buildup of the Centre's energy activities and encourage coordination, an internal energy committee was established, chaired by the Director of the Office of Planning and Evaluation (OPE). Established in 1979, the office is responsible for the operations of the Centre's five regional offices located in Colombia, Egypt, Kenya, Sénégal, and Singapore.

The OPE was created to increase the Centre's effectiveness in achieving its objectives. If IDRC is to remain responsive to the needs and priorities of developing countries, it requires a clear knowledge of those needs. Thus, OPE is

involved in acquiring information on research resources and priorities.

As John Hardie, OPE's Deputy Director, stresses: "We are trying to mirror the Centre's philosophy of maximum involvement of local people in defining priorities." Thus, developing countries are given the opportunity to look at their own planning processes for research activities. This year, pilot studies have been undertaken in Costa Rica and Colombia. These studies aim to provide information on national research resources and institutions, how resources are currently allocated, and what national research priorities are. They should assist IDRC as well as the countries concerned in deciding on research resource allocation.

Other countries and regions have studied particular sectors — the allocation of resources to agricultural research in Asia and social sciences in the Middle East, for example. These activities have led to the creation, in Asia and Latin America, of regional groups of national research directors who are carrying out more detailed studies on such issues as scientific personnel planning and research management.

A new project, funded in 1982 in Cameroon, involves the Panafrican Institute for Development (PAID) in studying the resources devoted to agricultural research to help plan future development. It aims to ensure that the evaluation activities that it supports serve the information needs of particular users and are recycled into the planning process. In recent years, some individual projects and programs have been examined in depth. OPE is relying more on local persons to carry out these evaluations — in fact, it is often the project recipients who request that an evaluation be undertaken — to contribute to building and strengthening research evaluation capability in developing countries.

The Centre's regional offices are increasingly responsible for administering and monitoring planning and evaluation activities. This strong representation in the regions served by IDRC is essential

if the Centre is to be fully aware of needs and priorities and to be able to respond effectively.

To reinforce the Centre's responsiveness, IDRC's regional directors this year presented reports to the Centre's Board of Governors on the needs of their regions and the effectiveness with which IDRC is responding to those needs. This fresh perspective should help the Centre identify research sectors and activities in which it can make the most useful contribution.

## Funding the Future

The general purpose of the Fellowship Program, administered by the Secretary's Office, is to assist in the training and upgrading of the qualifications of individual researchers, managers, and planners in scientific fields related to the broad mandate of IDRC. The program aims at building their research capabilities and thus strengthening research institutions in the Third World.

The Fellowship Program endeavours to meet these objectives by offering various types of awards, which vary in nature and number, according to changing needs as perceived by the Centre. The Program focuses principally on individuals from the least-developed countries and places greater emphasis on professional upgrading rather than on basic training. Tenure takes place in centres of excellence located, in order of priority, locally, regionally, in Canada, or in another developed country. IDRC award-holders are expected to return to their home country at the end of tenure.

The following Fellowship Program awards are not generally open to public competition because they must reflect Centre programs and projects:

- Pearson Fellowships are named after the former Canadian Prime Minister, Lester B. Pearson, who was Chairman of IDRC's Board of Governors from 1970 until his death in December 1972. They are offered to outstanding young public servants from Third World countries.

- Research Fellows are senior academics, researchers, policymakers, or planners who are fully committed to the field of international development. Fellowships are given to scholars from Canada or Third World countries and appointments are made by the Board of Governors on recommendation by the President.
- Program-related Awards are aimed at increasing the human resource base of research institutions in the Third World. These awards are directed to researchers as well as administrative and financial personnel in program areas that are of concern to IDRC.
- Project-related Awards are directed to researchers who have been, or are to be, associated with IDRC-supported projects. Training programs vary and include short-term courses tailored to the needs of the project, as well as academic studies leading to a post-graduate degree, preferably at the Master's level.
- Group-training Courses are designed for researchers, technicians, and administrative personnel from Third World countries. The courses provide for training that is not degree-specific, and are generally taught by staff members of local and regional institutions.
- Young Canadian Researchers are doctoral students registered in a Canadian university (students at the Master's level may be considered in the fields of Health Sciences and Communications). The objective of this program is to encourage the involvement of young Canadian researchers in scientific areas of concern to IDRC and to give them, at the same time, exposure to problems of Third World countries.

In addition to the above awards, the Fellowship Program contributes financially to the training programs offered by: The International Foundation for Sciences in Stockholm, Sweden; and The Hague Academy of International Law at The Hague, The Netherlands.



## Communications

Disseminating the results of research supported by the Centre and promoting the importance of development research are the dual roles of the Centre's Communications Division.

Under its publications program, the division produces a wide range of monographs and technical studies for worldwide distribution, particularly in the developing countries. It also produces publications of a more popular nature, such as this review, a quarterly magazine in three language editions, a feature-article service for news media in developing countries, and the IDRC annual report.

and southern Africa, and from Southeast Asia, to improve their skills in communicating information about science and technology for development to the general public in their countries through the mass media.

This transfer of information is essential if the populations of developing countries are to understand and participate in their countries' development efforts. These two workshops followed an earlier one for francophone African journalists held in Dakar, Sénégal, in 1981. The participants at Dakar and Nairobi have since formed regional science-writers' associations to further the exchange of scientific information among African mass media.



**Young journalists sharpen their skills: mass media do more than entertain in the developing world.**

Complementing this program, greater attention is being paid to developing and strengthening scientific publishing activities in developing countries through consultation and copublishing ventures.

The division has also supported some important initiatives in media development in the Third World that complement its in-house activities. For example, it has been supporting the production of science-oriented feature stories by development news agencies in Asia and Latin America.

In 1982, the division also supported international science-writing workshops in Nairobi, Kenya, and Dumaguete City, Philippines, on development science writing. These workshops are aimed at helping young journalists from eastern

The division also produces films for both educational and training purposes. In 1982, two IDRC films won awards at the ninth International Scientific and Technical Film Festival held in Brussels. "La pêche secondaire . . . un cadeau des mers" (Fish by-catch . . . bonus from the sea), about an IDRC-supported project in Guyana, won in the category of natural-resources management. "Project Impact: the overview," about a novel system for providing mass primary education, took the medal in the category of films about teaching methods.

The list of publications and films produced by the Centre during 1982 follows. Catalogues of all current IDRC productions are available on request.

## Publications

**IDRC annual report 1981–1982, Rapport annuel CRDI 1981–1982.** 120 p. IDRC-003/82e,f

**L'adieu au pilon: un nouveau système de mouture mécanique en Afrique.**

P. Eastman. 68 p. IDRC-152f (Also available in English IDRC-152e)

**Approvisionnement en eau dans les régions rurales des pays en voie de développement : compte rendu du colloque tenu à Zomba (Malawi) du 5 au 12 août 1980.** 137 p. IDRC-167f (Also available in English IDRC-167e)

**Les problèmes d'assainissement dans les pays en voie de développement: compte rendu sur la formation tenu à Lobatsi (Botswana) du 14 au 20 août 1980.** 166 p. IDRC-168f (Also available in English IDRC-168e)

**Una decada de aprendizaje: Centro Internacional de Investigaciones para el Desarrollo, División de Ciencias Agrícolas, Alimentos y Nutrición: Los primeros diez años.** 192 p. IDRC-170s (Also available in English IDRC-170e and French IDRC-170f)

**Remote sensing and development: report on IDRC-supported projects in the Sudan, Bolivia, Tanzania, Bangladesh, and Mali.** R. LeBlond. 24 p. IDRC-174e (Also available in French IDRC-174f)

**Root crops in eastern Africa: proceedings of a workshop held in Kigali, Rwanda, 23–27 November 1980.** 128 p. IDRC-177e

**International Development Research Centre: projects, 1970–1981.** 384 p. IDRC-180e (Also available in French IDRC-180f and Spanish IDRC-180s)

**Renewable resources in the Pacific: proceedings of the 12th Pacific Trade and Development Conference, held in Vancouver, Canada, 7–11 September 1981.** H.E. English and A. Scott, editors. 293 p. IDRC-181e

**Asignación de recursos para la investigación agrícola: actividades del taller efectuado en Singapur, del 8 al 10 de junio de 1981.** D. Daniels y B. Nestel, editores. 171 p. IDRC-182s (Also available in English IDRC-182e and French IDRC-182f)

**Low-cost transport in Asia: a comparative report on five cities.** R.B. Ocampo. 77 p. IDRC-183e

**Nutritional factors involved in the goitrogenic action of cassava.** F. Delange, F.B. Iteke, and A.M. Ermans, editors. 100 p. IDRC-184e

**Intercropping: proceedings of the Second Symposium on Intercropping in Semi-Arid Areas, held at Morogoro, Tanzania, 4–7 August 1980.** C.L. Keswani and B.J. Ndunguru, editors. 168 p. IDRC-186e

**SALUS: Low-cost rural health care and health manpower training: an annotated bibliography with special emphasis on developing countries, Volume 9.** R.M. Bechtel, editor. 149 p. IDRC-187e

**Computer-based conferencing systems for developing countries: report of a workshop held in Ottawa, Canada, 26–30 October 1981.** D. Balson, R. Drysdale, and B. Stanley, compilers and editors. 43 p. IDRC-190e (Also available in French IDRC-190f)

**Eight years of their lives: through schooling to the labour market in Chile.** E. Schiefelbein and J.P. Farrell. 207 p. IDRC-191e

**Searching: review of IDRC activities 1981.** 40 p. IDRC-192e (Also available in French IDRC-192f and Spanish IDRC-192s)

**Aquaculture economics research in Asia: proceedings of a workshop held in Singapore, 2–5 June 1981.** 128 p. IDRC-193e

**Devindex 1980: index to 1980 literature on economic and social development/index de la littérature sur le développement économique et social produite en 1980.** 174 p. IDRC-194e,f

**Food drying: proceedings of a workshop held at Edmonton, Alberta, 6–9 July 1981.** G. Yaciuk, editor. 104 p. IDRC-195e (Also available in French IDRC-195f)

**Tourism in the Caribbean: the economic impact.** S.B. Seward and B.K. Spinrad, editors. 163 p. IDRC-196e

**Asian cropping systems research: microeconomic evaluation procedures.** G.R. Banta. 56 p. IDRC-197e

**Fish by-catch . . . bonus from the sea: report of a technical consultation on shrimp by-catch utilization held in Georgetown, Guyana, 27–30 October 1981.** 163 p. IDRC-198e (Also available in French IDRC-198f and Spanish IDRC-198s)



**Bivalve culture in Asia and the Pacific: proceedings of a workshop held in Singapore, 16–19 February 1982.** F.B. Davy and M. Graham, editors. 90 p. IDRC-200e (Also available in French IDRC-200f and Spanish IDRC-200s)

**Agricultural policy in India: growth with equity.** J.S. Sarma. 94 p. IDRC-201e

**Livestock in Asia: issues and policies.** J.C. Fine and R.G. Lattimore, editors. 192 p. IDRC-202e

**Devindex 1981: index to selected literature on economic and social development/index d'ouvrages sur le développement économique et social.** 186 p. IDRC-203e,f

**Village handpump technology: research and evaluation in Asia.** D. Sharp and M. Graham, editors. 72 p. IDRC-204e (Also available in French IDRC-204f and Spanish IDRC-204s)

**Financing educational development: proceedings of an international seminar held in Mont Sainte Marie, Canada, 19–21 May 1982.** 142 p. IDRC-205e (Also available in French IDRC-205f)

**Éducation, travail et emploi: revue sommaire.** M. Woodhall. 56 p. IDRC-TS30f (Also available in English IDRC-TS30e and Spanish IDRC-TS30s)

**Educational networks in Latin America: their role in the production, diffusion, and use of educational knowledge.** E. Schiefelbein. 44 p. IDRC-TS39e (Also available in French IDRC-TS39f and Spanish IDRC-TS39s)

**Recommended methods for development-information systems: volume I. Manual for the preparation of records in development-information systems.** G. Morin-Labatut and M. Sly. 272 p. IDRC-TS40e

**Low-income urban shelter projects: an annotated bibliography of research funded by IDRC–IBRD.** 61 p. IDRC-TS41e (Also available in French IDRC-TS41f and Spanish IDRC-TS41s)

**The IDRC Reports/Le CRDI Explore/El CIID Informa** — Published in three separate language editions, this is a quarterly magazine of report and comment on the work supported by IDRC and on related activities in the field of

international development. Total circulation of the English, French, and Spanish editions is about 19 500 per issue, of which approximately 50 percent is to the developing countries, 30 percent within Canada, and the remainder to other countries.

### **IDRC Features/Reportages CRDI** —

This monthly news feature service on scientific, technical, and educational subjects related to development is provided free of charge to selected news media in the developing world. During the past year, 50 articles, many of them written by IDRC staff with others by selected contributors, were distributed in English and French to some 600 publications in 92 countries. Arrangements have also been made with several agencies based in the Third World and producing features services to distribute IDRC Features to an even wider audience. Clippings and comments on the materials distributed are received from editors of publications as far afield as Argentina and Zambia.

### **Films**

**The Mysterious Milkfish: Increasing Yield Through Research** — In Southeast Asia, the milkfish is popular not only for its taste but also for its nutritional value. In the Philippines, where it is one of the few affordable sources of protein, the supply is seasonal and uncertain, and only about half the captured fry ever survive to market size. "The Mysterious Milkfish" documents how scientists at the Southeast Asian Fisheries Development Center (SEAFDEC) in the Philippines have succeeded in breeding milkfish in captivity, and explains how their gradually increasing knowledge of the species may lead to greater productivity in the milkfish industry. The 27½ minute, 16-mm colour film was produced by Neill McKee for IDRC.

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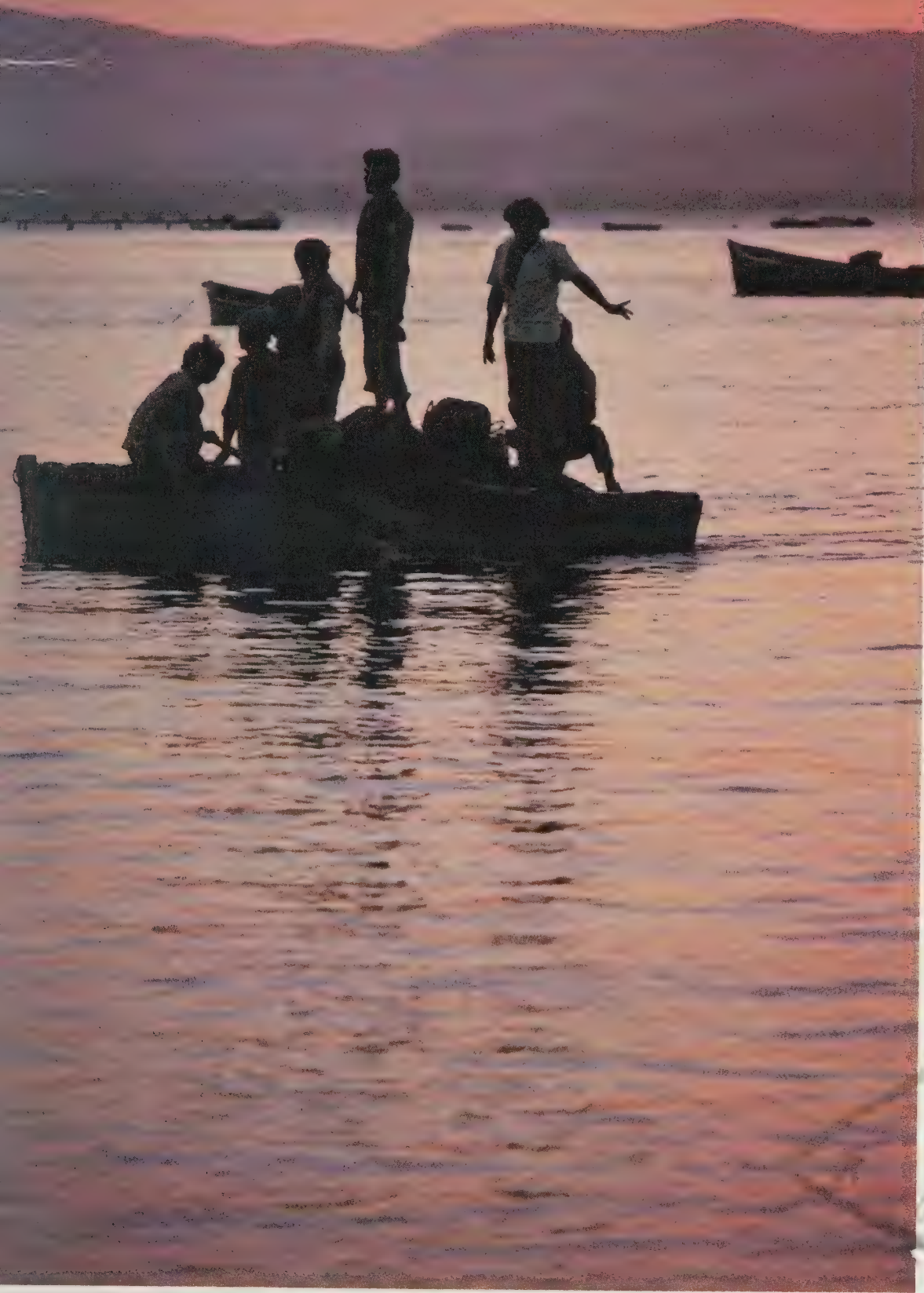
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# SEARCHING

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# INTRODUCTION

When the Parliament of Canada created IDRC in 1970, it employed special legislative language to express its intent: "A corporation is hereby established to be called the International Development Research Centre consisting of a Board of Governors . . ." The statute then provided that Governors "must have experience in the field of international development or experience or training in the natural or social sciences or technology." Provision was also made for the Board to be of an international character.



*The Board of Governors meeting in Ottawa in October 1981.*

In a very real sense then, the Board *is* the Centre; it consists of persons of distinguished qualifications; it is reflective of 11 different countries (six of them in the developing regions of the world). Governors meet every six months to monitor Centre activities, to consider proposals for new research projects, and to share with one another their perceptions of the needs of developing countries and the means by which IDRC can most effectively respond to those needs. The discussions of these persons — whose names are listed on page 40 — are as expressive of the reality of the world within which the Centre functions as it is possible to be. These are not theoreticians speaking: they reflect life. Nor do they speak only as advisers: they are the Centre's decision-makers. When IDRC's Governors exchange views, Centre management pays heed, realizing that from no other source could Centre staff draw such wise counsel.



When the Governors met in late 1983 in Ottawa, the concerns they expressed were a vivid reflection of conditions in developing countries. So harsh are circumstances for the great majority of the population in much of sub-Saharan Africa, one Governor was prompted to suggest that the Centre explore the possibility of supporting research in survival techniques. The plight of millions, he said, is now so desperate that normal development processes are inadequate to prevent mass starvation and, probably, outbreaks of infectious diseases.

Another Governor emphasized how important it was that the Centre continue to regard development as much more than a mere economic issue. The social dimension is the ultimate key. "Given that that is the case," said another, "are we sufficiently attuned to the functions and effectiveness of political and judicial institutions in the different countries?"

"The research climate in many developing countries is now more hostile than I can recall it ever having been," added another Governor. "The pressures on governments, particularly in Africa, are so intense and the time periods within which they function are so short, that they are quite unsympathetic to longer-term studies. They need immediate results."

"All the more reason," said a colleague, "to encourage researchers to consider, at the outset of their work, the necessary linkage between research and practical application. Developing-country scientists must be encouraged to address the problems around them: their laboratories are their societies."

The Board gave its approval to 61 projects in the course of its three-day meeting and received reports on 130 other, smaller, projects that had been approved during the previous three months. As each proposal was examined, and information was produced in response to Governors' queries, the discussion made clear that the basic Centre policy of human-resource building — of enhancing the indigenous scientific competence of the developing countries — continued to appeal to the Board as sound and wise. "IDRC performs an important role," one developing-country Governor summed up, "because it supports not only projects, it supports people."

*Ivan L. Head  
President, IDRC*

# OVERVIEW

## Development in a World of Interdependence

THE severe global recession of the 1980s has served to demonstrate the growing and irreversible interconnectedness of all the nations of the world. What underlies this increasing interdependence, says the World Bank's *World Development Report 1983*, is the massive volume in trade and capital flows among all countries.

Developing countries remain particularly vulnerable to the economic fluctuations of the industrialized world. In 1950, the developing-country share of export trade was 36 percent; by 1980, that share had dropped to 21 percent. Another profoundly alarming economic trend is the foreign debt of the developing countries. From 1972 to 1982, the foreign debt of the developing countries rose from US\$91 billion to US\$529 billion.

The middle-income countries — mainly in Eastern Asia — have managed to maintain a certain economic momentum and have avoided heavy borrowings with their crushing interest burden.

Many countries in Latin America, however, have not been able to do so and have been forced to devalue their national currencies dramatically to prevent a liquidity crisis. The situation in this region is so serious that some Latin American countries are now speaking openly of declaring a moratorium on debt payments.

Low-income countries in Africa are particularly dependent on exports of primary commodities and have suffered the most from global economic turbulence. Their per-person income

has continued to fall, and it is now believed that it will be lower by the end of the present decade than it was in 1960.



Cooperation, not protectionism, will ensure that the global recession does not inflict further damage.



According to another recent report released by the World Bank, in sub-Saharan Africa — the Sahel — the combined effects of chronic, widespread drought and the impossible task of servicing debts and loans are almost nightmarish. The agricultural sector is a particularly worrying element in the overall African situation. Raw data now being examined by the International Food Policy Research Institute (IFPRI) suggest that for the past 10 years there has not been any increase in yield per hectare for any food crop — a circumstance distinct from that in the two other major developing regions. At the same time, there has been no overall increase in land dedicated to food crops.

As the *World Development Report* states: "The crisis of the past few years has highlighted the bonds that join the economies of the developed and developing countries." It is only through enhanced international cooperation, and not through economic and other forms of protectionism, that the global recession can be prevented from inflicting further damage.

In the context of the global recession, which is only now beginning to ease, development must be seen in a truly long-term perspective. It calls for policies that will make for fundamental changes in the future, and yet be practical and viable now.



THE SAHEL AT DROUGHT

## The Research Environment

The economic recession has had a marked effect on the research environment in the developing countries. In many, research budgets have been cut or frozen.

In several parts of West Africa, the combination of high inflation and depressed output has meant that many researchers have been preoccupied mainly with personal survival. Fledgling infrastructures in education, research, and communications are nearing collapse. Such an assault on social, economic, and political structures could mean that the critical achievements of the past two decades in the areas of agriculture, literacy, and health will disappear.

In one African country, funds for travel to the field sites of government-sponsored research projects were stopped, effectively wiping out one year's work. The collapse of the East African Community (EAC) in the early 1970s has resulted in the disappearance of a number of regional scientific journals and in the inability to produce the proceedings of important workshops and conferences.

In other parts of the world, especially in Latin America, economic and political conditions are leading to serious, and sometimes terrible, human repercussions. These vary from general governmental suspicion or disapproval of scientific inquiry, particularly in the social sciences, to outright repression and persecution of researchers.

The supply of research funds from the international donor community to the developing countries has also been constrained as a result of the economic recession. This has tended

to diminish, disperse, and demoralize fragile research infrastructures.

In the midst of this bleak scenario, however, there is a ray of hope. In some parts of the world, particularly in Asia, research communities, institutions, and systems have made significant progress. Some countries have created national research coordinating bodies that either possess or have the potential for directing research resources to better effect. Some have substantially increased their budget allocation for research. In 1982, India increased direct investment in scientific research from US\$576 million per year to US\$888 million.



### The IDRC Response

The Centre was established and continues to be run mainly along disciplinary lines. The major program disciplines are: Agriculture, Food and Nutrition Sciences (AFNS); Health Sciences; Social Sciences; and Information Sciences.

The AFNS Division did not implement any major changes in program direction in 1983. It plans, however, to place greater emphasis on stimulating the demonstration and adoption of some of the agricultural technologies developed over the past years. Closely related to this is a planned shift toward more projects on integrated farming

and postproduction methods. Another change will be toward more projects in social forestry — that is, trees for food, fuel, fodder, and fertilizer.

One of the most significant program changes has taken place in the Health Sciences Division, where a maternal and child health program, started in 1983, accounts for 30–35 percent of the division's budget. Components of the previous programs on fertility regulation methods and rural health-care delivery have been included in this new program.

The division's long-term strategy calls for the construction of regional health profiles. These will cover key indicators of needs and priorities, such as institutional research capacity, availability of qualified human resources, and general health status. In particular, the division will give high priority to strengthening local research



which may take 10 to 20 years to implement in the future and yet be viable now.

capacity and to research in specific disease sectors.

In the Social Sciences Division, concern in 1983 continued to be focused on providing combined forms of support where research environments appear fragile and institutions untested. The division recognizes the need for workshops, study tours, group and individual training, consultancies, and short-term research funding to help lay the foundations of viable research structures.

The strategy of the Information Sciences Division in 1983 continued to be the fostering of cooperative information systems through which information collected by one country can be made available to many others. Of importance is that projects of this sort have an enduring quality. In this sense, the division consistently provides funding to establish true programs of support to research and development with the inherent objective of assuring continuity beyond a specific project-termination date.

The division also began to provide greater support for the development and testing of methods and tools that can be used by cooperative information systems: for example, in the area of telecommunications to facilitate information transfer through affordable techniques of data transmission.

In 1983, the Fellowships and Awards program became a fully operational division, further emphasizing the importance that the Centre attaches to the provision of formal training opportunities in development research.

The Cooperative Programs Division, created as a unit in 1980 to fund projects that encourage direct collaboration between research institutions in the developing countries and their counterparts in Canada, has now established an earth sciences program. A large share of the division's budget remains open for the exploration of new research areas. Proposals

have been received in such diverse fields of applied science as electronics and genetic engineering.

The pages that follow contain a brief review of the present outlook and research-development priorities in each of the major developing regions and they highlight some of the Centre's responses to these priorities in 1983. A description of the Centre's efforts in Canada to stimulate thinking and concern about development issues is also presented.



# AFRICA



**A**FRICA'S 30.4 million square kilometres make it the second largest continent in the world; it is exceeded only by Asia. Its two most spectacular land features are the Great Rift Valley and the Sahara Desert. The rift is one of the longest such systems on the Earth. It passes from the Red Sea in the north, through the highlands of Ethiopia, and then through East Africa where it divides before reappearing in Southern Africa.

The awesome Sahara is part of an immense desert stretching some 4800 kilometres across Northern Africa. This great sea of shifting sands, so inescapably present in the African geopolitical reality, is the result of subtropical subsidence of air that prevents significant cloud formation and is a dominant feature of the general atmospheric circulation of the globe.

The Sahara in the North and the Kalahari Desert in the Southwest cover nearly 28 percent of the African continent. An additional 20 percent is covered by soils that are too poor to sustain significant vegetation. Almost as extensive are the ferralitic soils that have suffered extensive leaching of the nutrients essential to most food crops.

One can begin to understand why, when three-quarters of the people of Africa live in rural areas, agricultural production is chronically low and constitutes one of the continent's most serious problems.

Some African soils, however, are rich in copper, chromium, and gold. There are also large known reserves of minerals such as potassium and phosphorus that can be processed into agricultural fertilizers. There are abundant supplies of the raw materials of the cement industry as well as other building materials such as gypsum,

asbestos, and vermiculite. However, the resource bases of individual nations vary from great abundance to extreme paucity.

### The Present Outlook

The severe worldwide recession has been particularly difficult for the fragile economies of many African nations. Faced with the ever-present task of surmounting terrible environmental difficulties, a poorly developed resource base, sometimes frightening shortfalls in agricultural production, and draining social and political conflicts, these countries groan under the weight of debt-servicing charges that are almost beyond the point of endurance.

It is the low-income, oil-importing countries that have suffered the most, with an increasing percentage of precious foreign-exchange earnings needed to finance the importation of oil and petroleum products. Even with the recent decline in oil prices, the sometimes sharp devaluation of national currencies has meant that, in real terms, they continue to pay even more for oil.

In some of the oil-exporting countries too, economic disarray is severe. On the assumption that oil revenues would continue to rise, they invested heavily in their social and physical infrastructures and bolstered capital investments with heavy external borrowings.

Agriculture is also suffering. The vicissitudes of climate, such as the relentless and devastating drought in Southern Africa, have turned Zimbabwe and a number of other countries from net food exporters into net food importers. And in other regions, particularly the Sahel, the need for fuelwood, combined with a recurrent drought, continues to turn more potential farmland into desert waste.

Although Africa is not overpopulated, population growth nonetheless is the highest in the world. Most countries have simply not



been able to match population growth with food production, and the demand for services and jobs, especially in urban areas, does not augur well for the next few years.

### The Research Environment

The global recession means that the challenge faced by the research community in Africa has never been greater. Development as a prescription for survival takes on a particularly poignant meaning in these difficult circumstances.

Seemingly relentless desertification, crop losses because of poor processing and storage, and the difficulty of finding an appropriate level of farm mechanization make agricultural production the unquestioned research priority in Africa.

The need is for shelterbelts, the restoration of treed areas, and much improved yields of food legumes, which are the cheapest and most regular supply of protein throughout much of the continent.

In the last decade, North Africa has witnessed rural-urban and transnational migrations of the work force on a scale unprecedented since the eighth century and the spread of Islam. This phenomenon, particularly as it manifests in the receiving countries, has been identified as a major problem in a recent in-depth study of the region's research priorities in the social sciences.

Applied technology in the area of communications and information is lacking. This hampers the sharing of scientific knowledge and progress in research, especially applied research.

The continued widespread presence of such crippling parasitic illnesses as schistosomiasis and acute and severe diarrhea is a major preoccupation of health researchers. And, with industrialization, occupational diseases and hazards are now a concern, whether they result from the use of potentially toxic chemicals or of machinery.

Only a better trained work force can take up the challenge of assuring that Africa takes its rightful place in a world of sophisticated technology. High levels of illiteracy and the need to adapt education to the continent's development priorities are the two main targets of education specialists.

### Regional Office for the Middle East and North Africa

IDRC's regional office in the Egyptian capital of Cairo serves 22 countries with a total population of 240 million people straddling two continents — an area that stretches from Iran in the east to Morocco in the west and covers 14 million square kilometres.

Since 1970, IDRC has funded some 119 projects in the region, totaling over \$21 million.

#### The countries

Algeria	Malta
Bahrain	Morocco
Cyprus	Oman
Democratic	Qatar
Yemen	Saudi Arabia
Egypt	Sudan
Iran	Syria
Iraq	Tunisia
Jordan	Turkey
Kuwait	United Arab
Lebanon	Emirates
Libya	Yemen

The Agriculture, Food and Nutrition Sciences (AFNS) Division's forestry program in the region continued in 1983 to address the need to contain desert lands by supporting research on the construction of shelterbelts and the restoration of treed areas in North Africa and throughout the Sahel.



*Nurturing seedlings to contain the desert in North Africa.*

The Ministry of Agriculture in Egypt, with IDRC support, is working with scientists from the International Potato Center (CIP) in Peru to adapt the use of improved potato seeds to the planting practices of the small growers in the Nile River Delta.

In the Sudan, a country with immense agricultural potential, the division continued in 1983 to support Sudanese scientists in establishing a comprehensive program of legume research on faba beans, lentils, and haricot beans. The second phase of this long-term project emphasizes on-farm trials.

In 1983, the AFNS Division continued to support international agricultural research centres. Major project support will enable the International Center for Agricultural Research in the Dry Areas (ICARDA), in Syria, to breed and screen genetic material and to develop cultivation practices conducive to increased production of food legumes.

The beneficial effects of breastfeeding to both mother and child are widely known. Following earlier research, a project supported by the Health Sciences Division is helping Egyptian scientists to determine the



pattern of ovulation in nursing women during and after postpartum amenorrhea, the period during which menstruation stops after a woman gives birth.

In many developing countries, only meagre services are available for maternal health care. With support from Health Sciences, researchers have undertaken a study of the problems in the delivery of maternal health care in rural Sudan and will test and evaluate a method for improving it.

Ongoing research activities in developing countries sometimes suffer from lack of coordination and documentation. IDRC's Information Sciences Division has expanded its support to the information centre of the Syrian Ministry of Agriculture, which will now collect, record, and disseminate data on agricultural research projects in collaboration with the Current Agricultural Research Information System (CARIS) of the United Nations' Food and Agriculture Organization (FAO).

Date palms, originally cultivated in the Near East and North Africa, are among the oldest cultivated crops in the world. As date trees die, few new plantations are being established because of high costs and low prices for the produce. Information Sciences provided funding in 1983 to the Palm and Dates Research Centre in Iraq to establish an information storage and retrieval system to serve researchers and extension officers trying to help small-scale farmers in poor areas of the region.

In Turkey, a number of private institutions, governmental agencies, and universities are conducting research on new and renewable sources of energy. Little is known about their efforts, however, and they work in relative isolation from each other and from the industrial sector. A project supported by the Social Sciences Division will permit researchers to produce and dis-

seminate an inventory of research activities and publications on selected new and renewable sources of energy in Turkey.

In Egypt, the absence of a consistent regional-development strategy has allowed new industries to concentrate in Cairo and Alexandria. With support from the Centre's Information Sciences Division, the Institute of National Planning in Cairo will prepare a series of industrial planning maps to help assess the implications of different development strategies throughout the country.

## Regional Office for West and Central Africa

The IDRC office located in Dakar, the capital of Senegal, serves 24 countries with a total population of 200 million. The most acute problems in the region are agricultural and socioeconomic.

Since 1970, IDRC has financed more than 186 projects in the region, totaling about \$27 million.

### The countries

Angola	Guinea-Bissau
Benin	Ivory Coast
Cameroon	Liberia
Cape Verde	Mali
Chad	Mauritania
Congo	Niger
Central	Nigeria
African Republic	Senegal
Equatorial Guinea	Sierra Leone
Gabon	Togo
Gambia	Upper Volta
Ghana	Zaire
Guinea	

The Social Sciences Division has been the most active with respect to the number of projects, although the AFNS Division is still the largest in terms of the amount of money spent.

In the social sciences, there are three priority areas: the consequences of large-scale human migrations from



*Education must be tailored to the development needs of each society.*

rural to urban areas; the economic viability of modernizing small agricultural operations; and educational systems suited to the development needs of each society.

Research supported by the Social Sciences Division in 1983 includes a complete evaluation of the role played by irrigation in Niger. Personnel requirements, income, and soil productivity will be studied in three areas with different cultivation systems: rainfed, irrigated, and the system used on the alluvial plain along the banks of the Niger River.

The training of management per-

sonnel to conduct research in education has long been a major problem in francophone Africa. Another project of the Social Sciences Division will train 15 researchers each year in research methodologies appropriate to the study of the educational processes peculiar to West Africa.

In most African countries, the output of nationalized industries is poor. The lack of local technical skills is at the root of the problem. In Ghana, the division has supported a project to determine the effect of local technologies on the productivity of nationalized industries and to assess



the level of nationalization of the country's industries.

In 1983, the AFNS Division continued to support research in the Congo to select the highest yielding and most disease-resistant varieties of cassava, to determine their acceptability to the farmers, and to assess their possibilities for industrial use. Similar research is under way to develop varieties of rice suited to the conditions of West Africa.

In Upper Volta, the first phase of a project supported by the AFNS Division identified the best methods for storing cowpeas to reduce the estimated 40 percent production losses caused by insects, fungi, and rodents. The second phase, funded this year, is designed to implement the improved storage systems. It includes demonstrating the methods tested in the first phase to farmers and popularizing construction techniques.

In Nigeria, the division continued to support research on windbreaks,

essential to improve farming and stop erosion in the countries of the Sahel. Initially, the research concentrated on identifying the best species of trees, perfecting efficient planting techniques, and assessing their agronomic and economic impact. The work already begun will be followed up with comparisons of the benefits of planting shelterbelts as opposed to conventional windbreaks.

The objective of the Information Sciences Division is to improve the dissemination of scientific knowledge in Africa. For instance, it helped to establish a documentation centre at the Organization for Research on African Food and Nutrition (ORANA), located in Dakar, Senegal.

The division also supported an information-gathering project in 1983, with a view to setting up a computerized data base at the Sahel Institute in Bamako, Mali. The assistance is part of a collective effort to gather and disseminate scientific and technical information in the Sahelian countries. The Sahelian Scientific and Technical Information and Documentation Network (RESADOC) — a decentralized cooperative information system established by the Permanent Interstate Committee for Drought Control in the Sahel (ICDCS) — is directly involved.

The Cape Verde archipelago off the western tip of Senegal has been independent only since 1975. Although small, this former Portuguese colony has established a good reputation for its dynamism and good management of international aid. Despite its efforts, however, it remains extremely poor. The Information Sciences Division has provided considerable assistance to give the Cape Verde government access to international scientific documentation through the Pan-African Development Information System (PADIS).

In West Africa, as in other regions of the Third World, tropical diseases



*Agriculture: the key to Africa's economic future*

such as malaria, schistosomiasis, and leishmaniasis are a major obstacle to development. The Health Sciences Division provided assistance to the World Health Organization's (WHO) Special Programme for Research and Training in Tropical Diseases. The aim of this program is to bring all the appropriate specialists together in a multidisciplinary approach to fight these diseases.

The training and development of African science writers is one of the primary interests of the Communications Division. In 1983, it subsidized a training course at Yaoundé in Cameroon for science writers from several francophone African countries. It also supported the Association internationale des journalistes scientifiques africains (AIJSA) whose principal objective is the dissemination of scientific and technical information in the popular media.

**Regional Office for Eastern and Southern Africa**

IDRC's office in Nairobi, Kenya, is responsible for an area consisting of 19 countries with a total population of 135 million.

Since 1970, the Centre has supported 154 projects in the region with a total value of about \$24 million.

**The countries**

Botswana	Mozambique
Burundi	Rwanda
Comoros	Seychelles
Djibouti	Somalia
Ethiopia	Swaziland
Kenya	Tanzania
Lesotho	Uganda
Malagasy	Zambia
Malawi	Zimbabwe
Mauritius	

The region's priority is to reach a significant level of technological self-reliance so that it is no longer totally dependent on economic policies and directions taken abroad. This is a great challenge to the research community.

During 1983, IDRC's Information Sciences Division and its Communications Division initiated a number of activities aimed specifically at collecting information on the research environment. The Centre has supported avenues for publishing and disseminating scientific information and, at the same time, strengthening and improving the quality of published material. For instance, important material support has been provided to several journals of social science to allow them to continue to publish. A project begun in Nairobi in 1983 is assisting three research institutions in the region to strengthen their in-house technical editing capacity and to establish long-range publishing programs.

Information Sciences continued to give major support in 1983 to the International Council for Research in Agroforestry (ICRAF) in two areas: the question-and-answer service in agroforestry to deal with scientific and technical queries from concerned scientists and research institutions, as well as to assist the Council in establishing its own information and documentation capabilities; and improvement of the Multiperiod Budgeting and Economic Assessment of Perennial Crop Intercropping System (MULBUD) software package designed to perform economic analyses of agroforestry schemes.



In Ethiopia, plans for the production of a much-needed national atlas have lagged behind similar efforts in other countries. A project supported by Information Sciences will allow the Ethiopian Mapping Agency to produce an atlas containing 64 pages of coloured maps and accompanying texts.



*Normal crop loads must be reduced after harvest.*

The AFNS Division has emphasized research on root crops and oilseeds. At the same time, it has ensured that, within crop-improvement programs, scientists try to understand problems at the farm level and test promising new technologies with farmers to facilitate acceptability.

Following a request from the Council of Ministers of the Southern African Development Co-ordination Conference (SADCC), AFNS provided major support in 1983 to enable the Zimbabwean Ministry of Agriculture, on behalf of SADCC, to identify and

develop the most efficient existing agricultural postharvest systems in the region. These include food processing, storage, and preservation technologies, rural food industries, and marketing and distribution systems. SADCC's request reflected the commitment of Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, and Zimbabwe to harmonize their economies.

Traditional methods of farming and ranching are associated with a low level of agricultural productivity for much of the rural population in Kenya.

ICRAF has identified Eastern Africa as an ecological zone in which agroforestry research should be initiated and AFNS has supported a project that will enable Kenya's Agricultural Research Institute to develop agroforestry systems for the semi-arid areas throughout the region.

Sorghum is the staple cereal for most inhabitants of Somalia, a nation seriously deficient in food. Earlier support from AFNS enabled Somalia to establish an enduring national sorghum program. Continued support in 1983 means that researchers will be able to develop technology acceptable to small-scale farmers in the rainfed growing areas of Somalia to improve sorghum production and utilization.

The Health Sciences Division funded a new project in Kenya on the control of schistosomiasis. This widespread parasitic disease, transmitted through contaminated water with snails as the intermediate host, is one of the leading causes of illness and death in the developing world. The project in Kenya will evaluate the effectiveness of an innovative, community-based approach to fighting schistosomiasis. Another Health Sciences project in Kenya enabled the Ministry of Health to begin to plan effective control programs to prevent eye infections in the newborn. The results will be of significant interest to many other countries in the Third World.

IDRC's Social Sciences Division is particularly concerned with rural development in Southern and Eastern Africa. In Kenya, one consequence of rapid population growth is pressure on relatively scarce agricultural land. The division supported a project to analyze the interrelationships between agricultural development and population variables.

The fisheries along Somalia's extended coastline are seriously underexploited. Although the government is keen to develop this important

source of food, it lacks information about the coastal communities engaged in artisanal fishing. Support from the division in 1983 will enable researchers to investigate the fish catch and fishing techniques in the north-eastern region of the country and help plan the development of coastal fishing.

During the 1970s, the countries of sub-Saharan Africa experienced major macroeconomic problems — accelerated inflation, serious balance-of-payments deficits, fiscal and debt crises, and reduced growth. The Social Sciences Division provided major financial support to design a macroeconomic analysis program on the issues affecting the economic stability of countries throughout the region and to enhance the capacity of local scholars and institutions to conduct high-level research in the field.



# ASIA





**A**SIA is the world's largest continent; it is also its most diverse and complex. Its 44 million square kilometres encompass a host of ethnic groups with hundreds of languages and countries at every stage of development. There are thousands of years of social and cultural evolution between the high technologies of nations such as Singapore and South Korea, and the primitive hunting and fishing economies of remote forest tribes in Borneo.

Perhaps the most popular and evocative image of Asia is its enormous population. Half the human race lives there: two-and-a-half billion people. The two most populous nations on Earth are in Asia — China and India — and two other countries — Indonesia and Japan — each have a population exceeding 100 million. Asia's rate of population growth is a little over two percent per year and, although there is increasing awareness of the awesome challenge and difficulty this may mean in the future, the continent's population will probably be close to four billion by the end of this century.

Less than 10 percent of Asia is under cultivation. In recent years, however, the development of high-yielding varieties of rice and other cereals has had a marked impact on Asian agriculture. The continent now accounts for fully 60 percent of the world's rice production. Wheat, maize, sorghum, and millet are also cultivated on a large scale in such countries as China, India, Iran, Pakistan, and Soviet Asia.

Asia's continental immensity assures it great mineral wealth. There are abundant reserves of coal, oil,

natural gas, uranium, bauxite, and other ores, and it has vast water resources and therefore great potential for hydroelectricity and irrigation.

The textile industries, particularly the cotton sector, have expanded greatly in Asia since the end of the Second World War. Japan and India are the world's largest exporters of cotton textiles. China, Hong Kong, South Korea, Taiwan, Pakistan, and the Philippines have also increased in importance as exporting nations.

Western civilization owes much to Asia. In fact, it was only in the 18th and 19th centuries that significant industrial and technological achievements and innovations began to shift from Asia to Europe. Three centuries before Christ, when European culture was still embryonic, Asians had already refined the arts of cooking, pottery, and the smelting of ores. In agriculture, irrigation was practiced widely, as was crop rotation. Literacy was advanced. A form of paper and elaborate scripts were in use. Artists used the techniques of wood carving, stonecutting, calligraphy, and the casting of metals for exquisitely beautiful works. Empires had evolved intricate systems of rules and laws delegating power and authority to institutions at various government levels, in the process creating complex bureaucracies.

### The Present Outlook

Of all the countries of the developing world, those in Asia have best withstood the inflictions of the present global recession. This is partly because they started from a relatively strong position. China and India, for instance, had an impressive record of progress in agriculture and steadily increasing exports. And they were not so dependent upon foreign trade as to be devastated by reductions in it.

Malaysia and Indonesia, middle-income oil-exporting countries, were able to rely on accumulated foreign-exchange reserves from oil revenues as



an effective cushion against a decline in export earnings.

Also, significantly, although trade declined on the international level, it expanded considerably within the region. In 1981 and 1982, intra-regional trade, as a percentage of trade with all countries, increased from 19 percent to 26 percent for exports, and from 15 percent to 20 percent for imports. Moreover, the Association of South East Asian Nations (ASEAN) has achieved progress in the areas of preferential trading arrangements and the establishment of industrial joint ventures in the private sector.

**The Research Environment**

In Asia, as elsewhere in the world, it is important for researchers and their national governments to identify and define the socioeconomic, health, and other issues to which they should give priority. Although some research institutions in the region are quite evolved, others are not yet sufficiently developed and lack information structures with enough data to guide inquiries into their countries' pressing questions.

Particularly wanting are the areas of health, social sciences, and information processing. In the health sciences, research is needed in basic health services in rural and urban slum areas, new types of health personnel, and effective health education. High priority must also be given to the improvement of water-supply systems and sanitation in squatter settlements and rural areas. In the countries undergoing rapid industrialization (e.g., Hong Kong, Singapore, and South Korea), studies on occupational health and safety have become a priority.

One of the weakest research structures in Asia is in the field of information gathering and dissemination, particularly at the national and sub-national levels. Some of the major libraries are attached to transnational institutions where financial support has resulted in the introduction of re-

sources in terms of labour, expertise, and equipment. These information services rarely reach the grass roots, however, and the need is to develop information infrastructures on an individual-country basis.

**Regional Office for Southeast and East Asia**

Since 1970, IDRC has funded 577 projects in Asia, totaling \$77 million. Until the opening in 1983 of the Regional Office for South Asia, in New Delhi, all the projects were within the province of the Centre's office in Singapore.

In the South Pacific region, many of the newly independent island-nations, isolated and scattered across a vast expanse of ocean, must rely entirely on foreign sources of information. The Information Sciences Division

**The countries**

Afghanistan	Laos
Bhutan	Malaysia
Brunei	Papua New Guinea
Burma	Philippines
China	Singapore
Fiji	South Korea
Hong Kong	Thailand
Indonesia	Tonga
Kampuchea	Viet Nam

in 1983 provided major funding support to create a bibliographic centre — the Pacific Information Centre — on development-oriented literature. This regional facility, to be located at the library of the University of the South Pacific in Suva, Fiji, will serve as the focal point and secretariat for a South Pacific information network.



*Development of high-yielding varieties of rice has often greatly had a marked impact on Asian agriculture*

A major project of this division in 1983 was to provide substantial funding to establish an Information Centre on Development-Policy Modelling, at the Systems Research Institute (SRI) in Poona, India. The project involves the development of computer-based models for large-scale simulation in the formulation of broad socioeconomic policies.

Information Sciences sponsored an important project on the use of remote sensing to help Thailand better manage its mangrove resources and at the same time safeguard the welfare of

rural populations earning their living from the mangrove environment. This will be of interest to other countries because, throughout the coastal regions of Southeast Asia, mangroves — delicate ecosystems consisting of evergreen swamp forests — are being depleted at an alarming rate.

The Health Sciences Division is particularly concerned with three problem areas in Asia: water resources and sanitation; occupational health; and population growth.

A new project is supporting a study in Hong Kong, the Philippines,



Singapore, and South Korea to evaluate working conditions and occupational health services in selected small-scale industries dealing with metal-working, lead, and lead compounds.

Pesticide poisoning in developing countries is being increasingly recognized as a serious public health problem. The Expert Committee on Insecticides of the World Health Organization (WHO) estimated in 1972 that more than 500 000 cases of accidental pesticide poisoning occurred annually, and that about half of those cases were in developing countries. The Health Sciences Division, in 1983, began supporting a project to examine the problem of pesticide poisoning in four Southeast Asian countries to help national governments formulate effective policies and programs to control the problem.

Since 1976, IDRC has been supporting research to develop more effective pumping systems for rural water supply. These projects have demonstrated convincingly that simple polyvinyl chloride (PVC) components can be used to manufacture hand pumps, making it possible to maintain and repair them at the village level with local resources. Health Sciences is now supporting the development of an instruction manual for the installation, maintenance, and repair of the PVC pump in Asia. The manual will be designed for illiterate and semiliterate villagers and will incorporate their input.

The division also sponsored a project on nonsurgical sterilization of women. Researchers will study the feasibility of using quinacrine hydrochloride, a well known drug on which human and animal data are extensive, in clinical trials in Indonesia, Malaysia, and Thailand.

In the past decade, the Agriculture, Food and Nutrition Sciences Division (AFNS) has funded



*Major research projects have been funded in aquaculture and mariculture.*

many major research projects in Asia, especially in crops and cropping systems, animal husbandry, and aquaculture and mariculture.

In India, where crop damage by locusts can be devastating, the division is supporting a project to find biological control agents for grasshoppers and locusts. If the project succeeds, the results could be of incalculable benefit to the agriculture of many other countries.

The division provided major funding support in 1983 to the Indian Council of Agricultural Research (ICAR) to continue its work on the genetic improvement of the "minor millets." These occupy some 4.5 million hectares in India and are subsistence crops for some of the poorest tribal and other rural people in South Asia and Africa.

The Philippines relies heavily on imports of oil for its energy needs. The AFNS Division is administering a project to utilize the gas from charcoal manufacture to fuel small-scale electric generators, and to find useful applications for the chemical by-products of charcoal production such as wood tar, acetic acid, and methanol. At present, these products are wasted and create a health hazard to the community by polluting the environment.

IDRC's Social Sciences Division, in 1983, began sponsoring an assessment of the impact of a large integrated rural-development project in 40 villages in the economically depressed district of Nang Rong in Thailand. Of particular significance is the fact that the project will provide valuable training for many social scientists, public-health experts, and agricultural economists.

On the Indian subcontinent, the division has supported a project on patterns of child mortality and morbidity. This is research to which the Centre has always provided active support.

In Malaysia, a project began in 1983, in collaboration with the Health Sciences Division, to investigate the sale and promotion of pharmaceuticals. The results could provide input for the formulation of a comprehensive national drug policy and be of great interest to health professionals who often do not have access to accurate information on many of the drugs that are commonly prescribed.

The division is also supporting an in-depth fertility study in China that will compare fertility, family planning, and other population characteristics of households in three provinces. This is a rare opportunity to understand better the dynamics of China's population, now estimated at one billion.

### New IDRC Regional Office for South Asia

On 2 June 1983, the Centre opened its second office in Asia. Located in New Delhi, the South Asia Regional Office will oversee projects in India, Bangladesh, the Maldives, Nepal, Pakistan, and Sri Lanka. The new office will be particularly valuable in helping the Singapore office concentrate further support on the weak research structures in the Pacific region.

#### The countries

- Bangladesh
- India
- Maldives
- Nepal
- Pakistan
- Sri Lanka



# LATIN AMERICA and the CARIBBEAN

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**S**OUTH America alone, from the Isthmus of Panama in the north to Tierra del Fuego in the south, covers 18 million square kilometres. There is great wealth in this region, and it consists of much more than the promise of gold and silver that lured the first explorers to America.

The Amazon Basin — the greatest river basin in the tropical world — has immense rain forests with perhaps the Earth's most important reserve of natural resources. At least 117 species of trees have been identified in an area as small as one square kilometre. The Amazon Basin has potential for agriculture and animal husbandry, and recent geological explorations have found mineral resources and oil. The greatest challenge facing Brazil and its Amazonian neighbours (Bolivia, Ecuador, French Guiana, Guyana, Peru, Surinam, and Venezuela) is, however, to preserve the delicate ecological balance that sustains the fertility of the soil.

There are large petroleum reserves around Lake Maracaibo in Venezuela, the coastal plains of Ecuador and Peru, along the eastern Andes of Bolivia, and in southern Patagonia, in Argentina. Latin America is also rich in iron ore and has large deposits of copper, tin, and manganese.

Industrialization is not advanced, however, and the economic base is largely agricultural. Although large amounts of coffee, wheat, and maize are produced, only five percent of the land is arable and, as in other developing regions, agricultural production is chronically inadequate. In the Caribbean, for instance, much of the land is porous limestone and seriously deficient in nutrients essential to agricul-

ture. And although the Caribbean has potentially important fisheries resources, they remain at an artisanal level and are unable to meet the area's needs.

Ethnologically, the region is one of the most diverse and vibrant in the world. Thousands of languages and dialects have been catalogued, documenting an unmatched linguistic and cultural multiplicity. The Caribbean alone has some 50 distinct geographical, political, and cultural entities. In spite of the region's astonishing diversity, however, most of its component countries share the same heritage — the Hispanic culture and an experience as former plantation colonies.

### The Present Outlook

Of the developing regions of the world, Latin America has perhaps been the most dramatically affected by the global economic recession. The region's crushing external debt and rampant inflation have devastated national currencies. In Argentina, Brazil, and Chile, currencies have depreciated to one- or two-thousandths of the 1914 value in terms of the U.S. dollar. At the end of 1982, these three countries had a combined net liability of US\$76 billion. Simply to service this debt in the face of falling exports has meant extreme economic vulnerability.

In many countries, the growth rate of the gross domestic product (GDP) has fallen sharply. Between 1970 and 1974, the average annual growth was 7.4 percent, but by 1981 it was only 1.2 percent.

An important positive trend, however, has been a significant increase in intraregional trade, somewhat lessening dependence on selling a narrow range of export commodities to North America and Western Europe.

Behind many of the region's economic difficulties is the "energy squeeze." Over the last few decades, the region's economic development — particularly in industry and transport —



has been closely related to the availability of relatively low-cost, oil-intensive technologies. These were imported from developed countries and used as substitutes for those based on traditional energy sources, which were usually abundant and economical.

Throughout Latin America and the Caribbean, low agricultural production is emerging as a critical and chronic problem. Several countries that were previously food self-sufficient are now rapidly becoming net food importers.

**The Research Environment**

The Latin American and Caribbean region has a relatively well developed research environment. What is required, however, particularly in the agricultural and energy sectors, is an assurance of continued help in funding and of more contacts with the international research community.

In most countries of the region, external funds represent 10–35 per cent of the total investment in research. In some of the smaller countries, they account for as much as 60 percent of the total funding for research. These sources are extraordinarily important as national research budgets are either cut or frozen and the foundations of research infrastructures erode.

There are several other major obstacles for research in Latin America. First, many countries have not been able to link private research activities (conducted mainly by organizations involved in export crops such as coffee and sugar) with those carried out through public resources. An emerging factor is the increasingly important role likely to be played by local private foundations as funding sources. In the future, it will be critical to mobilize such resources for research from the private sector.

Second, political crises in the area generate a great deal of anxiety within the research community. Establishing professional contacts with colleagues

in other countries is one way to give much-needed reassurance and support.

A third constraint to the effectiveness of research programs is the region's limited capacity for research management, which results in inefficient utilization of scarce resources. There is also the need — as in other developing regions — to forge a link between research and policymaking so that results may be effectively applied in the field.

**Regional Office for Latin America and the Caribbean**

The IDRC office in Bogota, Colombia, serves a region made up of 32 countries with a population of some 300 million people. Since 1970, the Centre has supported more than 527 research projects in the region for a total value of \$70 million.

**The countries**

Antigua	Guatemala
Argentina	Guyana
Bahamas	Haiti
Barbados	Honduras
Belize	Jamaica
Bolivia	Mexico
Brazil	Nicaragua
Chile	Panama
Colombia	Paraguay
Costa Rica	Peru
Cuba	Saint Lucia
Dominica	Saint Vincent
Dominican Republic	Surinam
Ecuador	Trinidad and Tobago
El Salvador	Uruguay
Grenada	Venezuela

IDRC, through its Office of Planning and Evaluation (OPE), has been especially concerned with monitoring the research environment in the region. For example, in 1982, a study was carried out in Costa Rica by IDRC and the Consejo Nacional de Investigaciones Científicas y Tecnológicas (CONICIT), and a preliminary report was published detailing the size and characteristics of the country's scientific community and its overall research orientation.

In Colombia, a study was initiated to evaluate the impact of IDRC-funded research carried out by the Centro de Investigaciones Multidisciplinarias en Desarrollo Rural (CIMDER). The IDRC-funded study attempted to apply and evaluate a strategy for rural development based on a system of primary health-care delivery that could eventually be used for activities in such other sectors as agriculture, education, and sanitation.

The Information Sciences Division's projects in Latin America and the Caribbean have concentrated on four areas: agricultural information, information on population problems, education information, and information related to development issues for policy- and decision-makers.

The division continued to provide substantial funding support to regional and transregional information centres in 1983. For instance, it has been cooperating for eight years with the Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS), a specialized body of the Pan American Health Organization (PAHO). The result has been the setting up of the Pan American Network for Information and Documentation in Sanitary Engineering and Environmental Sciences (REPIDISCA). With Centre support, the network is growing rapidly. In addition to the 30 national centres now operational, 8 new centres are being developed, and another 11 institutions have expressed a desire to



*Health care: this relationship between poverty and population growth is an old one.*

join the network during the next consolidation phase.

Market information related to the production and sale of nontraditional export crops in the Caribbean region is virtually unavailable. This has severely constrained the growth of intraregional trade in food products. Information Sciences support enabled the Association of Caribbean Transformation (ACT) to begin to develop and test a pilot market-information system that will provide current market information on domestic food commodities in three countries of the region.





*Species about which little is known threaten the growth and survival of South American farmers.*

South American camelids (alpaca, guanaco, llama, and vicuna) live in an area of approximately five million hectares in the High Andes of Argentina, Bolivia, Chile, Ecuador, and Peru. However, the survival and growth in numbers of these animals are threatened by diseases and the lack of scientific knowledge necessary for efficient husbandry. Support from the division helped the Instituto de Fomento Lanero (INFOL) in La Paz, Bolivia, and the Instituto Veterinario de Investigaciones Tropicales y de Altura (IVITA) in Lima, Peru, to create a specialized information service on South American camelids.

IDRC's Agriculture, Food and Nutrition Sciences Division (AFNS) has concentrated on two research areas within the region: animal sciences, and crops and cropping systems. Projects dealing with the latter have contributed to an important change in the traditional approach to agricultural research in the region — more and more, scientists are demonstrating in their work an understanding of the farmers' opportunities and constraints.

The AFNS Division provided substantial funding to a research network

(PRACIPA) created by the International Potato Center (CIP) in Lima, Peru. This support will enable a project in five Andean countries to increase the rate of exchange of information and germ plasm and to promote training for farmers and technical staff.

The Fundación para la Aplicación y la Enseñanza de las Ciencias (FUNDAEC) in Cali, Colombia, has achieved a high degree of success both in rural education and in cropping-systems research. In the process, FUNDAEC has emerged as an important model for national and international institutions. With continued support from the AFNS and Social Sciences Divisions, FUNDAEC will conduct research in annual and perennial cropping systems as well as train young farmers, grammar-school teachers, and agronomists in a unique project combining rural education with small-holder cropping-systems research.

The necessity of providing employment to migrant settlers in the Amazonian region of Peru is already known through a project supported by the AFNS Division. The project yielded valuable insights into the complex ecology and production systems of the rain forests. Continued support in 1983 will permit further research to be carried out on the development of improved dairy-beef production systems appropriate to the unique Amazonian conditions and the preferences of the farmers.

Health Sciences projects in the region show a substantial concentration on rural health-care delivery systems, fertility control, and tropical diseases.

Over the past few decades, Costa Rica, like some other more developed Third World countries, has significantly improved the health of its people. More recently, however, and for reasons that are not clear, this trend has shown signs of reversing. The Centre's Health Sciences Division has pro-

vided major funding support for a project that will try to identify the social determinants, environmental conditions, and health characteristics of pregnant women that could explain the rising rates of low birth weight and neonatal mortality recently observed in Costa Rica. The results of this work could be of great interest to other countries.

In spite of major advances in diagnosis and therapy, infectious diseases continue to claim the lives of millions of people in developing countries. Although chemotherapy has been used successfully to treat chronic infections, such as leprosy and tuberculosis, the drugs of choice are too costly for most Third-World countries. In 1983, the division began to support a project to evaluate a short-term drug regimen to treat pulmonary tuberculosis in Brazil, where some 30 million people are thought to have had a history of the disease. The results may be of significant benefit to many developing countries faced with a high prevalence of infectious diseases.

Because of ecological conditions in Latin America, a devastating epidemic of yellow fever — a mosquito-transmitted infectious disease — could break out at any time and the present supply of vaccine is completely inadequate. A project supported by the division will seek to modernize and improve production facilities for yellow-fever vaccine in Colombia and Brazil.

IDRC's Social Sciences projects in the region have concentrated on two program areas: population, and science and technology. The second is an area in which Latin American social science researchers have taken a particular interest in the last decade.

Argentina's education system is one of the most developed in Latin America. However, the socioeconomic and political conditions of the past several years have had a serious nega-

tive impact on it, particularly at the secondary level. The Centre's Social Sciences Division supported the Facultad Latinoamericana de Ciencias Sociales (FLACSO) in Buenos Aires to analyze the structure and role of secondary education in Argentina in the context of the country's economic and political processes.

Although the central districts in the major cities of Latin America are known to suffer from poor housing, limited essential services, and pollution, there has been little research on these problems. The division supported a project that will analyze the socioeconomic and environmental problems of the central districts in Corrientes and Catamarca, in Argentina, and Montevideo, in Uruguay. The project will focus on the role of community participation in the rehabilitation of central districts.

Like many of the other economies of the Caribbean, Jamaica faces difficult economic conditions, one of the most dominant being a chronically high level of unemployment. Funding support from the division in 1983 will enable the Institute of Social and Economic Research (ISER) at the University of the West Indies, in Jamaica, to draw up a comprehensive profile of the spatial and sectoral mobility of the Jamaican labour force and develop suitable methodologies for assessing the interrelationships between labour-force mobility and national development strategies.



# CANADA and the THIRD WORLD

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**I**N an interdependent world, no nation can stand alone and claim immunity from the economic and other vicissitudes buffeting the world. Canada, as a major trading nation, is perhaps more conscious than some developed countries of the need for economic and other forms of cooperation. Although one hears occasionally of "aid weariness," of a certain lassitude toward foreign assistance, the Government of Canada remains committed to appropriating 0.5 percent of the gross national product (GNP) for overseas development assistance by 1985 and to reaching 0.7 percent of GNP by 1990.

In particular, IDRC is concerned with stimulating interest in development issues within Canada's academic and research community, and with forging effective, strong links between institutions at home and those in the Third World: these may be academic, governmental, or private-sector institutions. The two key means for doing this are the Cooperative Programs Division and the Fellowships and Awards Division.

### **Cooperative Programs Division**

Each year, an estimated \$150 billion is spent on research and technical development around the world: developing countries account for about three percent of this total. Of the three million scientists and engineers involved in these activities, only about 13 percent are employed in the Third World.

This stark disparity led developing countries at the UN Conference on Science and Technology for Development, held in Vienna in 1979, to ask

for greater access to research. Canada's response was the creation of a new program, administered by IDRC, that would enable developing countries to share in Canadian research and development expertise. IDRC's Cooperative Programs Unit was created in 1980 and became a full division in 1983.

Although the main objective of the division is to promote collaboration between research groups in developing countries and their counterparts in Canada, these cooperative projects respect the Centre's mandate of responding to the expressed needs of the nations of the Third World. Another important component of the division's philosophy is to encourage multidisciplinary research that could not be undertaken by any of the Centre's major program divisions. The division also seeks to help developing countries complement applied research at home with basic research in Canada, research involving sophisticated techniques and expensive equipment that put it beyond the reach of many developing countries for the foreseeable future.

An excellent example of the multidisciplinary approach in action is the Riverbank Erosion Impact Study in Bangladesh. Each year, the plight of the rural poor in Bangladesh is exacerbated by the flooding of three major river systems that permanently displaces thousands of people by eroding away their meagre landholdings. Until this year, there had been little interchange between the physical and social scientists on the subject, or between the research community and the planners. Now, however, a major cooperative project will bring together researchers from the Department of Geography of Jahangirnagar University, Dhaka, and the University of Manitoba, Winnipeg. By mobilizing the expertise of many disciplines and institutions half a world apart, this project will attempt to develop techniques for forecasting river-channel



migration and policy options for dealing with its effects.

In 1983, the Cooperative Programs Division financed a large prospecting project in West Africa. A Canadian engineering company, Cartier-Monenco, has become a partner of the Senegal Peat Company. The goal of the project is to identify potential peat sites in the region of the Casamance and Siné-Saloum rivers. It is hoped that the use of peat will permit a considerable reduction in the consumption of the heavy fuel imported into Senegal to meet domestic energy needs, and contribute to the conservation of the country's forests.

Over the past several years, the East China Normal University (ECNU), in Shanghai, has been collaborating with the University of Victoria, in British Columbia. ECNU is responsible for training lecturers and teachers for some 200 normal colleges and secondary schools throughout China. With financial support from the division, ECNU will collaborate with the

University of Victoria in the design and implementation of seven specific research projects in curriculum and cognitive development, evaluation, educational administration, adult education, and computer-assisted instruction.

Liaison with other donor agencies is important to the Centre. For instance, IDRC shares information on development-research priorities and activities with other agencies to maximize the general effectiveness and impact of development assistance. The Centre and five other agencies are currently carrying out a pilot project to create a shared data base — the Inter-Agency Development Research Information System (IDRIS). It is intended that this information be made available to developing and other countries concerned with development issues.

### Fellowships and Awards Division

"The decisive factors of production in improving the welfare of poor people are not space, energy, and cropland; the decisive factors are the improvement in population quality and advances in knowledge." These are the words of Nobel laureate and former IDRC Governor Theodore W. Schultz. The idea that investing in people is basic to achieving economic progress is at the centre of all IDRC projects.

The activities of the Fellowships and Awards Division (FAD) are a direct application of this strategic idea, and seek to build up the human capital of researchers, administrators, managers, and planners needed for development.

In 1983, the Fellowships Program, which had been administered by the Office of the Secretary and General Counsel, became a full division. The change reflects the growing importance the Centre attaches to direct human investment in the training of researchers.



Image © See the growth of humanity

FAD assists in the training and upgrading of the qualifications of individuals working in fields related to the broad mandate given IDRC: agriculture, health, information, communications, and social and economic policy. A variety of awards, study grants, and training programs are supported. The principal focus is on people from the least-developed countries, and on professional development rather than basic training. Award holders pursue their studies at recognized centres of excellence in research or education either locally, within their region, or in Canada or another developed country. Award holders are expected to return to their home country at the end of their program to apply their newly refined skills.

In 1983, the division spread its investment in people over a range of awards and training activities.

A senior fellowship enabled a senior researcher from India to undertake a one-year working sabbatical to study changes in agriculture in South Asia and how they will affect food-grain production.

Ten Pearson fellowships, honouring the late Canadian Prime Minister, Lester B. Pearson, allowed young public servants from developing countries to pursue professional training in Canada. In 1983, the fellowships were in the field of health care.

Eight Canadian professionals in mid-career were given professional development awards to improve or update their skills and knowledge in international development or to adapt their skills to development needs. Topics included the impact of communications and development projects aimed specifically at women.

Thirty-five program-related awards went to researchers, administrators, and financial personnel in developing countries to undertake training programs of either an academic or applied nature. Among them: training in science journalism for a West African



*Investing in people is basic to achieving economic progress.*

newspaper reporter; study toward a master's degree in library science for an awardee from Sri Lanka; and a short course on solar disinfection in water supply and sanitation for two award holders from Lebanon.

Thirty-seven pre- and postproject awards enabled researchers who have been, or will be, involved in IDRC-supported research in developing countries to undertake training related to the needs of their research. Higher degree studies have been undertaken in civil engineering (Mexico), education research (Nepal), epidemiology (Sudan), and plant biology (Togo), to name just a few fields.

Seven young Canadian researchers took up awards designed to encourage the involvement of doctoral and master's students in the scientific concerns of development. Tropical medicine and anthropology were among the disciplines studied.

The division also contributed to training programs offered by the International Foundation for Science in Stockholm, Sweden, and the Hague Academy of International Law at The Hague, The Netherlands.

In addition to the different individual awards, the division sponsored eight group-training programs designed to improve technical, research, and administrative skills



through intensive practical training. This activity provided the opportunity, for example, for industrial researchers from around the world to investigate problem-solving methods in small-scale food industries.

The division sponsored a number of training courses in developing countries. One such project enabled Kasetsart University, in Thailand, to organize a one-month regional workshop on the socioeconomics of livestock production. Another, on research on urban problems in the developing countries, permitted a working group of the International Geographical Union to train specialists in the use of the latest techniques and methods of analysis; the course was held at the Universiti Sains Malaysia in Penang. A third project supported a follow-up research course aimed at familiarizing forest research officers from Asian and Pacific countries with the principles and practice of forest research, emphasizing wood production rather than utilization.

#### *Information Seminars in Canada*

Canada has a great wealth of experience and expertise on which to draw in assisting developing countries in harnessing research for human well-being.

IDRC's Communications Division has been active in helping to create bonds between the research community in Canada and the Third World. In 1983, the University of Manitoba and the division cosponsored a workshop to inform researchers and policymakers from Saskatchewan, Manitoba, and northwestern Ontario about research for Third-World development. It was an occasion to exchange information on mid-Canada's experience in various research fields

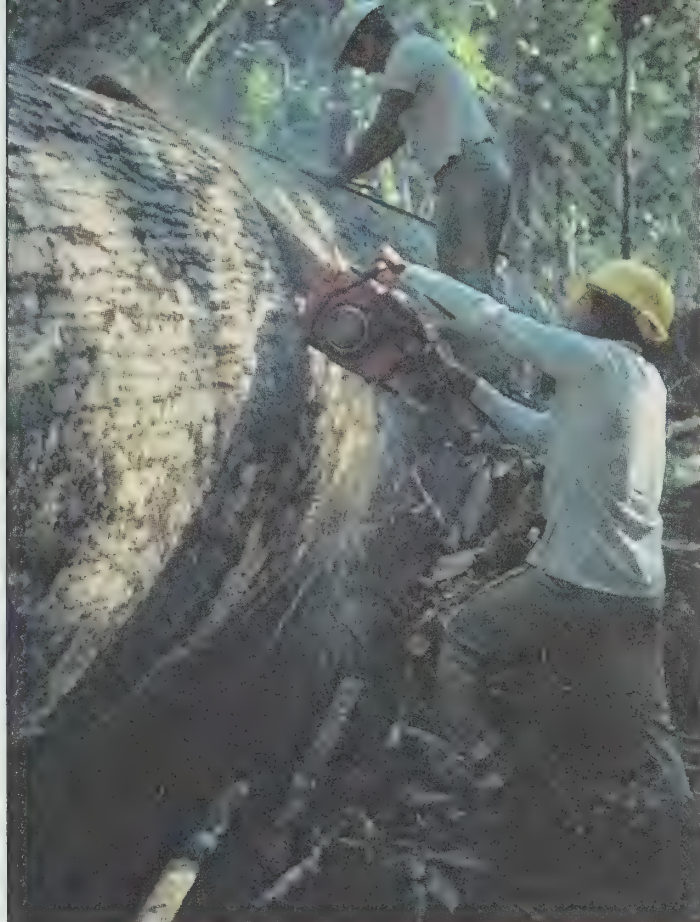
and to identify the capacity within the region for collaboration with developing-country research institutions. The three-day program focused on social science research, the geosciences, crops and cropping systems, postproduction systems, information systems, and communicable diseases.

#### *Energy Research*

A new area of research for the Centre, and one in which there was a significant development in 1983, is energy. The energy crisis continues to be felt much more acutely in the South than in the North. In developing countries, the energy crisis means much more than the inconvenience of higher gasoline prices. It means that the daily struggle to find wood for cooking or heating has become harder because all the available trees have been cut. It means farmers cannot afford the petroleum-based fertilizers or chemicals necessary for adequate food production. It means that meeting the bill for oil imports leaves little in the national budget for spending on health or education.

In response to the urgings of developing countries at the 1981 UN Conference on New and Renewable Sources of Energy in Nairobi, Canada pledged \$10 million for energy research to aid the Third World. IDRC was asked to begin the work needed to help developing countries make the transition to sustainable sources of energy.

In 1983, IDRC and the United Nations University in Tokyo jointly established an Energy Research Group (ERG) composed of 10 eminent energy specialists from developing countries. An independent body, ERG will survey the existing and potential capability of developing countries to conduct energy research and development. The group aims to work out the energy-research priorities for developing countries and to suggest how research resources can be better allocated.



*Examining the conditions of the environment.*

## Office of Planning and Evaluation

In a rapidly changing research environment, constant reconnaissance and analysis are needed to maintain the flexibility — or agility — to respond to genuinely changed needs and priorities.

In the Office of Planning and Evaluation (OPE), IDRC has just such a capacity. OPE assesses the Centre's projects and programs and provides the information needed to adjust operations and planning to remain effective and efficient.

For instance, in Ethiopia, IDRC has undertaken, with the Ethiopia Science and Technology Commission, an evaluation of the Centre's activities in relation to research priorities and developmental needs.

In Southeast Asia, where the Centre has been active for over a decade, a prospective study, funded in 1983, will scout for new ideas and recommendations for the planning of its activities in the region.

In addition, OPE calls upon the experience and resources of the Centre's six regional offices: in Colombia, Egypt, India, Kenya, Senegal, and Singapore. Each year, as OPE reviews the scientific environment and research priorities in the developing countries, it also coordinates detailed reports from the regional offices. These constitute an important element in the materials examined by the Centre's Board of Governors and by the scientific staff.

## IDRC's Resources Sector

Experience shows that many research projects have had only limited success — or have even failed — because of weaknesses in financial administration or human-resources planning. In recent years, some of IDRC's support divisions have begun to play an active role in helping research institutions eliminate or avoid these problems.

IDRC's Resources Sector, composed of the Office of the Comptroller General and Treasurer and the Human Resources Division, is currently funding a review of the management practices of a number of research institutions in the Sahel region of West Africa. The information gathered will be used to help design a series of training courses for all levels of management. It will also help in the formulation of recommendations to each institution on how to improve management and to each donor on how to ease the administrative burden placed on the recipient institution by the various demands of donors.

The Resources Sector has also funded management workshops in the Philippines, Singapore, and Thailand designed for research-project leaders and financial managers, as well as government representatives. Another project in East Africa is developing curriculum modules for training at various levels in the research organizations of the region.



## Books

**IDRC annual report 1982–1983/Rapport annuel CRDI 1982–1983.** 144 p. IDRC-003/83e,f

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**Le monde de l'alphabétisation : politiques, recherche et action.** 159 p. IDRC-117f

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**Absorption and diffusion of imported technology: proceedings of a workshop held in Singapore, 26–30 January 1981.** 112 p. IDRC-171e.

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**Preventing school failure: the relationship between preschool and primary education: proceedings of a workshop on preschool research held in Bogota, Colombia, 26–29 May 1981.** 178 p. IDRC-172e  
(Also available in Spanish IDRC-172s)

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**L'avenir des peuples pasteurs : compte rendu de la conférence tenue à Nairobi (Kenya) du 4 au 8 août 1980.** J.G. Galaty, D. Aronson, P.C. Salzman, et A. Chouinard. 432 p. IDRC-175f  
(Also available in English IDRC-175e)

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**Multiple cropping in the humid tropics of Asia.** A.A. Gomez and K.A. Gomez. 248 p. IDRC-176e

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**Systèmes de conférence informatique pour les pays en développement : compte rendu d'un séminaire tenu à Ottawa (Canada) du 26 au 30 octobre 1981.** D. Balson, R. Drysdale et B. Stanley. 52 p. IDRC-190f  
(Also available in English IDRC-190e)

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**Le séchage des produits alimentaires : compte rendu du colloque tenu à Edmonton, Alberta du 6 au 9 juillet 1981.** G. Yaciuk. 110 p. IDRC-195f  
(Also available in English IDRC-195e)

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**By-product utilization for animal production: proceedings of a workshop on applied research held in Nairobi, Kenya, 26–30 September 1982.** B. Kiflewahid, G.R. Potts, and R.M. Drysdale. 158 p. IDRC-206e

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**Cassava toxicity and thyroid: research and public health issues: proceedings of a workshop held in Ottawa, Canada, 31 May–2 June 1982.** F. Delange and R. Ahluwalia. 148 p. IDRC-207e

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**Basic housing: policies for urban sites, services, and shelter in developing countries.** A.A. Laquian. 163 p. IDRC-208e

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**A place to live: more effective low-cost housing in Asia.** Y.M. Yeung. 216 p. IDRC-209e

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**Fish quarantine and fish diseases in Southeast Asia: report of a workshop held in Jakarta, Indonesia, 7–10 December 1982.** 79 p. IDRC-210e

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**Leucaena research in the Asian-Pacific region: proceedings of a workshop held in Singapore, 23–26 November 1982.** 192 p. IDRC-211e

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**Searching: review of IDRC activities 1982.** 40 p. IDRC-212e.  
(Also available in French IDRC-212f and Spanish IDRC-212s)

---

**Educational research environments in the developing world.** S. Shaeffer and J.A. Nkinyangi. 288 p. IDRC-213e

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**Devindex 1982: index to selected literature on economic and social development/Index d'ouvrages sur le développement économique et social.** 302 p. IDRC-214e,f

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**SALUS: low-cost rural health care and health manpower training: an annotated bibliography with special emphasis on developing countries, volume 10.** R.M. Bechtel. 148 p. IDRC-216e

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**SALUS: low-cost rural health care and health manpower training: a cumulative index to volumes 1–10.** R.M. Bechtel. 150 p. IDRC-217e

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**Educational financing in developing countries: research findings and contemporary issues.** E. Schiefelbein. 168 p. IDRC-TS38e  
(Also available in French IDRC-TS38f)

---

**Universal primary education in Tanzania.** I.M. Omari, A.S. Mbise, S.T. Mahenge, G.A. Malekela, and M.P. Besha. 87 p. IDRC-TS42e

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**International socioeconomic information systems: an evaluative study of DEVSIS-type programs.** W.O. Aiyēpeku. 100 p. IDRC-TS43e  
(Also available in French IDRC-TS43f)

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**Checklist of publications associated with IDRC and recorded in AGRIS: 1975–1982.** 79 p. IDRC-TS44e

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## Magazine and News Service

**The IDRC Reports/Le CRDI Explore/El CIID Informa** — Published in three separate language editions, this is a quarterly magazine of report and comment on the work supported by IDRC and on related activities in the field of international development. Total circulation of the English, French, and Spanish editions is about 20 000 per issue, of which 52 percent is to the developing countries, 32 percent within Canada, and the remainder to other countries.

**IDRC Features/Reportages CRDI** — This news-feature service on scientific, technical, and educational subjects related to international development is published 10 times each year and distributed free of charge to selected news media in the developing world. During 1983, 35 feature articles written by IDRC staff and selected contributors were distributed in English and French to some 600 publications in 97 countries. Several news agencies in the Third World also distribute IDRC Features.

## Films

**Prescription for Health: Clean Water • Hygiene • Sanitation** — Every day in developing countries, waterborne diseases such as cholera, typhoid, and dysentery kill thousands of people, mostly children. The IDRC film "Prescription for Health," released in October 1983, promotes personal hygiene and community practices that can help break the cycle of infection. The film is aimed primarily at health-care workers, and water and sanitation engineers and technicians in developing countries. It is also intended as a prime source of information for policymakers. The 23-minute, 16-mm colour film, shot on location in Asia and Africa, was produced by IDRC's Communications Division.



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# SEARCHING

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# INTRODUCTION

An element of romanticism is generally present in any account of rural communities: “small towns” in the industrialized countries, “villages” in the developing countries. The undoubted advantages of those places — equitable social structure, a sense of belonging, community involvement — often overshadow in the mind of the observer many of the negative elements equally present.

Particularly today in the developing countries, village life is often nasty, brutish, and short. Increasingly as well, it is culturally arid. Governments, hard pressed to provide the basics of modern life to the inhabitants of cities, find that available resources seldom permit the extension into the countryside of adequate social services such as health care and educational facilities. Fresh, clean water, adequate shelter, waste disposal, food distribution, cooking fuel — these essential ingredients of even a tolerable life — are all too often missing in the villages of many Third World countries.

The result is that millions of people worldwide migrate toward the major cities. Desperate as is life in the violent, overcrowded slums of the metropolitan areas, it is often superior to what these rural people have left behind, and so they continue to come. The city attracts because of its promise of social amenities such as hospitals, schools, some welfare services, and the often ephemeral allure of employment. What the city may deliver, though, is overcrowding, pollution, and a new form of struggle.



*IDRC President Ivan L. Head in northern Thailand.*



Nevertheless, the flow continues. Monitored by such agencies as the United Nations Fund for Population Activities, the growth of Third World capitals is becoming exponential. In 1980: Mexico City, 15 million; Calcutta, 9.5 million; Cairo, 7.3 million. In some countries, the urban – rural population balance is approaching that of the industrialized north, but with a major difference: those left in the rural areas do not possess the skills and the means to grow food for the rest. Modern, mechanized agricultural practices are little in evidence in developing countries; as a result, shortages of farm labour at harvest time are far from unusual. When cyclical drought visits a region, as in much of sub-Saharan Africa at present, the circumstances combine to produce wide-ranging famine, affecting city and rural dwellers alike.

The Board of Governors of IDRC has always insisted that the primary beneficiaries of the Centre's support for science and technology should be the rural dwellers; new and hardier plant species, agricultural techniques specially adapted for peasant farmers, durable water pumps, better pedagogical methods, the means to combat infant diarrhea, and a host of other responses to the most basic needs of the rural population can and should be the products of modern research methodologies. Consequently, an overwhelming proportion of IDRC funds is dedicated to research in these areas. Research to diminish malnutrition, disease, illiteracy. Research to reduce the migration to the cities. Research to restore human dignity to life in the villages.

Some of those activities are described in the following pages.

*Ivan L. Head  
President, IDRC*

# OVERVIEW

## The Politics of Neglect

THE neglect, if not the abuse, of the rural dweller is an historical constant. Heavily taxed, food producers have rarely been allowed to enjoy the fruits of their hard labour. Yet it is their food surpluses that have made towns, cities, and what we have come to call “civilization” possible. It is their values and the remarkable enduring qualities of their villages that have provided our very cultural underpinnings. As Robert Redfield, the anthropologist and humanist has observed, culture first originates in villages and then flows into cities where it becomes systematized. It is also a culture, added Redfield, that possesses “a greater vitality and disposition to change” than city culture. The progress and destiny of humanity may well rest then on two rural resources that meet our most fundamental needs: food to alleviate hunger, and a moral vision to guide us as we stumble through history.

Though they number some 2.4 billion, most of the villagers and peasants of the Third World seem condemned to chronic political marginality. Poor, illiterate, exposed to debilitating diseases, and physically and culturally isolated, rural dwellers toil in solitude and silence while legislators, often oblivious to their plight, sit and debate in distant capitals.

The villagers’ landholdings are fragmented. Their tiny, disconnected plots cannot sustain an economically viable farming operation. Cereals are the subsistence diet, at an intake level scarcely above starvation. Cholera and other diarrheal diseases are endemic, and malaria, once believed on the edge of eradication, is making a startling comeback.

## UDIC’s Mandate

As the Organisation for Economic Co-operation and Development has consistently and correctly pointed out, “Rural development concerns the vast majority of the population of the Third World.” In some of the least developed countries of Africa and Asia, the rural component of the total national population exceeds 80 percent. In Ethiopia, it is 93.4 percent; Kenya, 90.8 percent; Nepal, 96 percent; and Indonesia, 83 percent. Even with today’s frantic pace of urbanization, the rural reality will not vanish in a jungle of concrete high rises. United Nations estimates indicate that, as the 20th century ends, the urban growth rate will decline in both developed and developing countries, but the rural growth rate will increase from 1.37 percent per annum (1959–1960) to 1.48 percent. This means that by the year 2000 at least another 300 million people will be living in the rural areas of the developing regions.

When the International Development Research Centre was created 14 years ago, the paramountcy of the rural reality was in the minds and hearts of its Board of Governors. At its inaugural meeting in October 1970, the Board expressed the wish that a substantial portion of the Centre’s activities focus on improving the well-being of rural dwellers, the last people to benefit from the advances of science and technology. As we will see in the pages that follow, the Centre has respected the wishes of its first governors and placed rural development at the core of its mandate.



One does not wish to paint too dark, too grim a picture of the rural dweller's daily life. Generally, a rural household at the same level of income as an urban household is likely to have a higher standard of living, and will be spared some of the humiliating brutalities inflicted on the millions trapped in city slums. The people who live in the countryside and the world's one million villages can count on a powerful sense of community for support, virtually indissoluble family bonds, and the serenity that comes from living in harmony with one's natural environment. But there are rural poor — and there are many.

About 40 percent of rural people in all developing countries live in absolute

poverty. In the lowest-income countries, the proportion is more than 50 percent. There is nothing vague or equivocal about absolute poverty. According to the World Bank, it is: "A condition of life so characterized by malnutrition, illiteracy and disease as to be beneath any reasonable definition of human decency."

Further, states the World Bank concerning these "absolute poor": "As much as four-fifths of their income is consumed as food. The result is a monotonous, limited diet of cereals, yams or cassava — with a few vegetables and in some places a little fish or meat. Many of them are malnourished to the point where their ability to work hard is reduced, the physical and mental development of their



*The rural experience: virtually indissoluble family bonds.*



children is impaired, and their resistance to infection is low. They are often sick — with tropical diseases, measles and diarrhoea, and cuts and scratches that will not heal. Complications in childbirth are a common cause of death. Of every ten children born to poor parents, two die within a year; another dies before the age of five; only five survive to the age of forty.

The great majority of poor adults are illiterate; their children, though having a much better chance of attending school than in the past, usually do not complete more than a year or two. Unable to read a road sign, let alone a newspaper, their knowledge and understanding is severely limited."

### Rural—Urban Disparities:

A host of social indicators documents the widespread poverty of rural dwellers in developing countries. In South Asia, only 17 percent of the rural population has access to potable drinking water; the percentage for urban settlements is 66 percent. In Latin America and the Caribbean region, the corresponding figures are 35 and 79 percent respectively. In Brazil, 60 percent of all poor households are rural; in Malaysia, it is 70 percent. In all, more than 1 billion rural dwellers have annual incomes under \$100 (US) a year.

There are rural—urban disparities in health and education. In rural Nigeria, there is only one hospital bed for every 18 450 people, whereas in the cities there is one for every 400 people. In Pakistan, the corresponding figures are 12 300 and 560. In Colombia, rural dwellers and those in small towns (64 percent of the total population) have access to only 9 percent of the country's doctors. In Ethiopia, there is one doctor for every 3000 people in the capital city of Addis



*Rural populations must have fresh, clean water.*

Ababa, but in the countryside there is only one doctor for 100 000–250 000 inhabitants.

In Latin America, 66 percent of primary schools in urban areas offer at least the first 5 years of schooling; in the countryside, only 6 percent of schools do so. Rural post-primary education is virtually nonexistent and those few students who continue their education must do so in cities. When they do, they rarely return to their villages to share their new knowledge. They remain in offices and factories, denying the countryside the productive labour resources it needs to meet the increased food demands generated by urbanization.



Many Third World countries have made heavy capital investments in centralized energy facilities designed to meet the needs of urban agglomerations. But most of their population is rural and their particular needs have been ignored. The daily search for fuelwood to prepare meals is destroying the tree cover in dry and alpine regions. It is estimated that



*The scope of rural development must be wide, touch every facet of life.*

close to 1 billion cubic metres of wood are harvested for fuel each year in the tropical zone. The worldwide rate of deforestation is staggering. Thailand has lost 25 percent of its forest cover in only 10 years; Costa Rica has lost 33 percent. Research is desperately needed on rural energy requirements.

The economic stagnation of the countryside, coupled with its sometimes extreme physical and cultural isolation, means that the most able-bodied and the best educated will migrate to cities where they feel they will at least have an opportunity to fulfill their ambitions. This debilitating human erosion condemns already impoverished villages to perpetual social and political marginality, and further stagnates agricultural production. In this scenario, the politics of neglect become rooted in pessimism and despair. Urbanites, better educated and politically organized, will continue to monopolize the attention of officials.

The scope of rural development must be wide for its social, political, and human implications are far reaching. Rural development cannot be limited to, or thought to consist solely of, changes in agricultural technology; it must touch every facet of rural life: education, health, water supplies, craftsmanship, communication, and transportation. To assign priority to rural development is to recognize that hunger cannot be alleviated unless people remain and prosper on the land. And in this truth may also lie our sense of destiny.

*Note: Though all the projects described have been officially approved by IDRC, in some cases the final agreement with the recipient may not yet have been signed.*



# FOOD — THE QUEST FOR SURVIVAL

THE quest for survival calls for a mystical bond between human beings and the land; from the mist of antiquity, cultivation has been inextricably linked to worship. In Assyro-Babylonian mythology, Marduk, the oldest son of the great god Ea, personified the fertilizing power of water; he made plants grow and grain ripen. Saturn, an ancient Roman agricultural divinity, celebrated each year with festive abandon, was synonymous with abundance. In old Confucian rites, Shen Nung, one of the great legendary emperors, was the Chinese deity of Medicine, Pharmacy, and Agriculture. His powers were abetted by a host of agricultural deities such as the Celestial Prince Liu, superintendent of the Five Cereals, and the god Hu-shen, who protected the fields against hail.

In countries where agroindustrial enterprises have supplanted subsistence farming, agriculture's link with belief, along with its origins, has been all but forgotten. The earliest forms of cultivation were long thought to have begun in the Near East, about 4000 BC. But more recent carbon and other dating techniques suggest that agriculture originated much earlier and that animal domestication probably preceded cultivation by several thousand years. Man may first have cultivated wheat along the Nile as early as 13 000 BC. Maize and beans were grown in Mexico and Peru by 6000 BC, and rice near Non Nok Tha in Thailand by 4000 BC or even earlier. Around this time, the Chinese were eating millet, gathering a variety of wild plants, raising pigs, and growing cabbage. They had also invented the pottery wheel, domesticated cattle, and made rice their staple crop. On the Central Asian Plateau, man was shaping animal and vegetable life as early as 11 000 BC. Precious cultivars of wild wheat and barley can still be found in this region today. And of



*Progress in chemistry and biology has unraveled many of the mysteries of plant growth and animal life.*

singular importance in present rural development strategies is the acknowledgment that agriculture was not invented by Neolithic man, the unsettled, wandering hunter, but by Neolithic woman, the collector.

Agriculture remains the source of livelihood for more than half the world's



population and a pivotal factor in the progress of nations. The economic advance of developed countries was made possible by the production of large food surpluses that permitted services in education and health, and the development of banking and commerce.

Only about 11 percent of the world's land area is arable. There is no direct relationship between the amount of arable land per capita and level of income. Europe, for instance, has about the same amount of arable land per capita as Asia, and considerably less than Africa. All significant advances in agriculture have been causally related to science and technology. Progress in chemistry and biology has unraveled many of the mysteries of plant growth and animal life. Fertilizers, insecticides, crop rotation, plant and animal breeding, and methods of cultivating and plowing are all largely the result of advances in science and technology. It could be argued that it is essentially the uneven application of science and technology in different countries that is largely responsible for the great agricultural disparities that we now see around the world.

### Science and Technology in Agriculture

In the age of "crisis journalism," where the flow of events is newsworthy only when it has reached some zero hour, there is an inherent danger in labeling anything as "critical"; media consumers can grow terribly weary of crises. But in the case of agriculture and food production in Africa, there is no better label. There are many reasons why Africa's situation is so desperate, a major one being a worsening of the continent's endemic drought. As it spreads from the eight Sahelian nations to 24 countries in all, this seemingly irreversible desiccation casts a terrible pall of despair over the

continent. In 1973 alone, 100 000 people died as a result of this climatic terror. But with better neonatal care and the widespread use of antibiotics in the last 15 years, many African nations have nonetheless seen their population increase by as much as 50 percent. The continent's overall population growth rate exceeds 3 percent a year; the annual rise in food production — before the drought worsened — was only 1.3 percent. The 1984 food deficit of 5 million tons is twice what it was a decade ago. If anyone is weary of crises, it is the hungry people of Africa.

Given the catalytic role of scientific progress in agricultural development, it is clear that the priority in Africa is to apply science and technology to the continent's unique soil, climatic, economic, and other essential characteristics. Since 1970, IDRC's Agriculture, Food and Nutrition Sciences Division (AFNS) has funded some 240 projects in Africa and the Middle East. In the past few years, there has been added emphasis on farming systems research, an approach that incorporates all the dynamics of a small farmer's operations, and ensuring that improved technologies are adapted through national agricultural programs.

### Farming Systems

The AFNS Division has provided significant funding support for farming systems research projects in Mali, Cameroon, and Ethiopia. Another such project has now been funded in Sierra Leone, a country whose population of 3.5 million is rapidly increasing at a rate of 2.6 percent a year. Rice, the major staple food crop, is grown principally by the traditional slash-and-burn method. Demographic and economic pressures, however, have left cultivators no choice but to reduce the fallow period of 8–12 years to as little as 4 years. In the rain



forest conditions of Sierra Leone and many other parts of West Africa, such a drastic reduction in the fallow period could easily result in a serious and permanent loss of soil fertility. IDRC has helped fund a pilot farming systems research unit in the Ministry of Agriculture designed to benefit small farmers and their families. Sierra Leone, a member of



*The reality of small-scale farming must guide innovations in technology.*

the recently formed West Africa Farming Systems Research Network (WAFSRN), will share research findings with other member countries.

The Centre's support of farming systems research extends to all developing regions. In Bhutan, a small landlocked country in the eastern Himalayas where 90 percent of the 1.2 million inhabitants depend on agriculture for their livelihood, low yields, particularly of rice, and the lack of research and trained professional staff are resulting in ever-larger deficits of food grains. Through the International Rice Research Institute (IRRI), the Centre is providing major funding support to help Bhutan develop appropriate technologies to increase productivity in rice-growing areas.

Underlying the Centre's focus on systems research is the principle that to understand the farm operation it must always be seen holistically. The world's most common farm is the mixed farm, as found in the humid and semi-arid tropics. In Asia, for instance, livestock contribute 20–40 percent of farm income. However, there is no research methodology to take advantage of new pastures and crop varieties, new rotations, and agricultural by-products to feed animals and improve the efficacy of these farms. The Division is now funding a new phase of research in the Asian Farming Systems Network, an organization that arose out of earlier multiple-cropping projects at IRRI funded by the Centre and other donors. Continued funding will help 12 countries, with more than 200 research sites in Asia, to use new methodologies and improve the productivity of crops and livestock. The Division recently fused its crops and cropping systems program with its animal sciences program.

Agricultural production on the Caribbean island of Jamaica typifies the situation faced by Third World farmers. Eighty-two percent of the farms on Jamaica are under 2 hectares in area; fully 90 percent of food-crop production is by small-scale farmers. And though 50 percent of the island's population is involved in agriculture, their labour generates mar-



ginal revenues, accounting for only 8 percent of the gross domestic product (GDP).

Most of the research on technology for small-scale farmers is on-station research and is largely unrelated to the reality of farmers' holdings. IDRC is providing funding support to the Jamaican Ministry of Agriculture and the Jamaica office of the Interamerican Institute for Cooperation on Agriculture (IICA), a branch of the Organization of American States (OAS), to undertake a farming systems research program in two major ecological zones. Researchers will try to identify improved production methods for the major cropping systems, and train project staff and associated personnel in on-farm research techniques.

### Network Support

IDRC's special effort to encourage a more precise application of improved farming systems can take the form of support to the regional and international agricultural research centres whose activities are linked to national research programs. In the past year, for instance, AFNS has provided substantial support to the International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria, to allow the latter to help members establish national farming systems research programs in their own countries.

Another example of IDRC's active and continuing network support is in the area of oilseeds research. Of great dietary importance, but often in very short supply in rural areas, oilseeds have received only fragmented research attention in spite of being a key crop for subsistence farmers. A few years ago, therefore, IDRC established an oilseeds network based in Ethiopia to link its projects in Eastern Africa, Sri Lanka, and the Indian sub-continent. The result was effective, practical liaison, as well as assistance in conducting new oilseeds research in Ethiopia. Oilseeds supply the essential fatty acids in the diet of most Ethiopians and the cake that remains after oil extraction is a valuable livestock feed. Improved technologies could lead to the use

of the residue as a source of protein in human diets. With continued funding, the network's adviser will pursue his work in the Ethiopian highland and lowland oil-crop projects, arrange for exchange visits by scientists to different projects in different countries, and compile an annual newsletter for project scientists. This is an important form of support to Third World scientists, who often feel isolated, that they lack the right kind of research experience, and that no one is interested in their work. If agriculture in Africa and Asia is to benefit from a solid research base, young scientists must not abandon their work.

In Latin America, an important example of IDRC network support is continued funding of the Tropical Pastures Network established in 1979 by the Centro Internacional de Agricultura Tropical (CIAT). Earlier IDRC support made it possible for the network to develop a methodology to evaluate tropical pastures on small parcels of land. With beef representing 10–24 percent of total food expenditures, and milk an additional 7–15 percent, pastures are important in Latin America. However, acidic, infertile soils constitute 40–50 percent of total land resources and the poor quality and quantity of forage have a marked negative effect on livestock production. Continued funding will enable further development of livestock production systems through the introduction of improved species of grass and legume pastures and will strengthen national research capabilities in pasture research.

## Practical Research

An example of the Centre's support for appropriate and significant technological change is grain dehulling and milling systems. Since 1970, the Centre has been actively involved in perfecting a dehuller originally developed by the Prairie Regional Laboratory (PRL) of the National Research Council of Canada. The PRL dehuller can remove the seed coats of tropical cereal grains (millet, sorghum, and maize) as well as tropical grain legumes (cowpeas, pigeon peas, and soybeans). But the basic dehuller is too large for most villages and the Centre is now funding a project to improve and field test a mini-dehuller for village use, and set up the manufacturing capacity to mass produce it for use within Senegal and for export to other West African countries. The dehuller may greatly help present-day Africans reacquire a taste for their native cereals and have an important impact on the continent's overall food situation.

## Food Storage

Increasing crop yields does not necessarily lead to higher farm incomes and living standards; prices paid to farmers are low and the costs for storage are high. Nor is agricultural production determined by growth rates alone. What happens to food once it is grown is also important. In Sierra Leone and in many other parts of Africa, inadequate storage sometimes accounts for large losses to rice crops. Earlier IDRC research support established that, though the moisture con-

tent of stored rice was maintained at an acceptable level, insect and microorganism infestations had a pejorative effect on seed quality. Continued funding will make it possible to field test improved storage containers of mud and straw to reduce postharvest losses of the country's vital rice crop.

The Centre has been providing funding support for postproduction systems in eight Andean communities of Peru since 1979. These communities represent a fascinating ecological and socioeconomic cross section of the approximately 2800 traditional Indian farm communities in the Peruvian Sierra. Some of the crops, such as quinoa, oca, tarwi, and kiwicha, date back to the very beginnings of Inca agriculture. This research, which has always stressed community involvement in documenting farming activities, has made it clear to everyone that it is necessary to develop appropriate postharvest technologies. Continued funding will allow the Peru office of IICA to develop improved techniques and systems for harvesting, preserving, and processing native grains and tubers.

## Cooperative Research

The Cooperative Programs Division supports projects that promote collaboration between research groups in developing countries and their counterparts in Canada. Part of its mandate is to explore new fields of research for IDRC, for example, the earth sciences and technology for local enterprises. When a project falls within an already established area of IDRC expertise, the funds may be administered by other program divisions. One such project links Guelph University, one of Canada's foremost centres of agricultural expertise, and Chile's largest private university, Pontificia Universidad Católica, to determine the biological changes occurring during storage that contribute to the hardness of common beans (*Phaseolus vulgaris*). Each year, developing countries produce about 5 million tonnes of beans, legumes rich in vital amino acids, and important supplements in cereal diets. The problem with



hard beans is that they require so much fuel for cooking. This project will develop simple and inexpensive roasting methods to arrest hardening of beans, and so improve keeping quality and reduce cooking times. The results could be important savings in energy for the world's poor, the largest consumers of this impor-



*Cooperation: sharing knowledge in a world of interdependence.*

tant, low-cost source of protein. IDRC has funded considerable research on legume quality in several countries — faba beans in Egypt, lentils in Lebanon, and common beans in Guatemala.

### *Sharing Knowledge*

Poor agricultural productivity is a multifaceted problem and must be addressed from several perspectives. The work of one division must be complemented by project support from other divisions. The Information Sciences Division's funding support to the Société nationale pour le développement rural (SONADER) in Mauritania will mean that valuable information on agriculture will

be collected, stored, and disseminated for the benefit of the country's researchers. Some 90 percent of the people of Mauritania live in rural areas, and the government has given agriculture absolute priority with the goal of reaching food self-sufficiency by the end of the century. The project links SONADER's Documentation Centre to AGRIS, the global information system for the agricultural sciences and technology, operated by the Food and Agriculture Organization (FAO) of the United Nations. Several other countries, Bangladesh, Egypt, and Senegal, for instance, have received similar support to enable and encourage their participation in AGRIS.

In Asia, where tremendous progress in agriculture has taken place as a result of cropping systems research, the introduction of high-yield varieties, and the better use and greater availability of fertilizers, the priority is information analysis. The Asian Vegetable Research and Development Centre (AVRDC) is an international institution funded by several governments and donor agencies to conduct research into vegetable legumes for the benefit of all the countries in the lowland humid tropics. Support from the Information Sciences Division will enable AVRDC to strengthen and expand its specialized information analysis on three important vegetable crops in Asia: Chinese cabbage, mung bean, and soybean. Vegetables, especially vegetable legumes, are very important sources of protein, vitamins, and minerals in populations where the major dietary component is low-protein starchy foods.

Support from the Communications Division to enhance indigenous scientific publishing competence further complements the research endeavors supported by other divisions. One such project, based at the International Rice Research Institute (IRRI), will provide editors from national research centres with training in the skills essential to writing, editing, and producing and disseminating publications reporting on research findings. Improving the clarity and quality of the material published, and ensuring it is effectively disseminated, helps the research initiatives of national programs to receive due attention and recognition, both at home and within the global scientific community.

### Forests For Food and Fuel

Ten years ago, the industrialized world was first alerted to an energy crisis far graver than rising prices and shortages of fossil fuels. The vanishing supply of wood energy for domestic use — mainly for cooking — may well be the single most important environmental issue facing developing countries. IDRC's forestry program, a subprogram of AFNS, has now supported more than 50 projects, 40 of which are still active. Given the nature of

the problem, that is, that wood supplies cannot be replenished quickly and research needs long-term funding, most of the forestry projects usually go through several phases and receive sustained support.

One such project is in Malawi. Ninety percent of the country's 6 million people live in arid and semi-arid areas and indigenous forests are being rapidly depleted as a result of agricultural expansion and increasing wood-energy demands. Here, IDRC has supported one of its most successful forestry projects. In less than 3 years, some 93 species trials have been conducted and valuable knowledge gained on planting techniques and the management of small-scale plantations on communal village lands and private farmlands. Small-scale landholders and villagers have become interested in tree planting and have enthusiastically participated in the



project. Exciting progress has been made toward providing rural dwellers with an adequate and continuous supply of wood for cooking, heating, construction, and shade. In the second phase, project officials will continue to work closely with the rural population by developing an active small-farm agroforestry program.

A new project, in Zambia, will be integrated into the network of IDRC-supported afforestation projects in this region. In Lusaka, the capital, the price of a bag of charcoal has increased fivefold in a year. In less than 2 years, the woodlands surrounding the city may vanish. The government is committed to solving the country's wood-energy problems but simply does not have the research data necessary to create fuelwood plantations. The project will identify fast-growing tree species and develop improved management practices suitable to plantations. Many villages and small-scale landholders will, therefore, have a valuable cash

crop, and the rural poor in the areas most affected by the region's chronic drought will have wood for cooking at a price they can afford.

Deforestation has taken its toll elsewhere in the world. In the arid and desertic areas of South America, national woodlands are terribly depleted. In some places they have been completely destroyed to meet local demands for fuelwood, fodder, and basic construction material. But large irrigation schemes developed in river valleys along the coast, and several sites adjacent to the irrigated lands not suitable for agricultural production, offer excellent opportunities for planting multipurpose trees. In Peru, earlier IDRC-sponsored afforestation pro-



*Desertification: climate and population pressure take their toll in a fragile ecosystem.*

jects concentrated on establishing tree plantations in the highlands and led to a separate project in the coastal lowlands. In this region, where half of the country's population lives, reliable low-cost techniques for establishing forest plantations will be developed. Particularly interesting will be a study of the feasibility of precipitating fog drip to irrigate the plantations in the southern coastal foothills. Trees could act as natural interceptors for the heavy low clouds that gather during the three or four winter months. Precipitation could reach 2 millimetres an hour.

Throughout Southeast Asia, the Information Sciences Division has supported a cluster of projects to help safeguard the welfare of rural populations earning their living from mangroves, fragile ecosystems consisting of evergreen swamp forests. In Indonesia, where nearly three-quarters of all the mangroves in the region are found, this source of livelihood for a very large part of the coastal population has almost been eradicated. With support from the Division, scientists at Gadjah Mada University in Yogyakarta will develop their country's capacity to carry out research into mangroves using data collected from remote sensing. This advanced technology, utilized previously in Thailand with IDRC support, will allow Indonesia to determine rapidly the exact nature and extent of the threat faced by this valuable ecosystem.

One country that has taken bold steps to meet domestic rural energy needs and stop the destruction of its wood reserves is the Philippines. A national electrification program based on 75 wood-burning plants of 3-megawatt capacity each is being implemented to meet about 20 percent of rural electricity needs by 1987. A project funded by the Centre's Special Program Activities (in-

itiatives that do not fall within the jurisdiction of major program divisions), and administered by AFNS, will use existing technology to develop a small-scale energy system of 20–50 kilowatt capacity to provide electric power to remote communities that cannot be connected economically to the planned rural electric grids. Based on locally available renew-



*Village woodlots: exciting progress in providing rural dwellers with multipurpose trees.*



able resources — for example, large plantations of fast-growing leguminous tree species such as *Leucaena* — the research will benefit the rural poor by providing a cheap source of power, and increasing revenues and employment.

The energy policy subprogram of the Centre's Social Sciences Division administers a number of projects concerned primarily with energy policy research. One project, in Brazil, will develop an original methodology for a complete evaluation of rural energy needs. Such a methodology is essential in many countries to complement centralized energy planning that cannot take into account regional and local peculiarities, particularly those concerning land use and availability.

The Centre also supports energy research through the Energy Research Group, an independent body of 10 eminent developing-country energy analysts and policymakers, co-funded by IDRC and the United Nations University, Tokyo. In the past year, the Group participated in a meeting at the Centre attended by major energy research donors, who reviewed the scope and range of energy research, particularly as applied to rural, small-scale use.

### *Bamboo and Rattan*

A cluster of projects on bamboo and rattan, supported by the forestry program of AFNS, is closely related to important rural needs, from low-cost construction materials to food, farm tools, and a wide range of woodenware. In Bangladesh, for instance, where bamboo is the main construction material for 90 percent of rural housing, it has become scarce and expensive. Funding support will continue for research on high-yield, high-quality bamboo in villages and state forests. A second phase will include a training component to help rural people propagate and manage bamboo groves in selected villages.

On Java, the most populous of the Indonesian islands, and where bamboo is as much a part of the rural reality as rice,

research will continue on ways to preserve bamboo from borer attack once it is felled. Another project there will identify improved methods to produce, collect, and use rattan. Indonesia produces and exports over 80 percent of the world's supply of raw rattan. This is a labour-intensive industry; entire villages depend on it. But the country's 9 million hectares of national rattan forests and communal plantations are being depleted by land development and overexploitation. This research will benefit neighbouring countries in Southeast Asia who must also arrest the depletion of their bamboo and rattan resources.

One such country is Sri Lanka. Bamboo and rattan have been used there for centuries for housebuilding and handicrafts, but demand now exceeds supply and a valuable source of revenue is unavailable for the rural economy. A project will train local staff to undertake research on both indigenous and exotic species by establishing pilot plantations.



*Rattan is essential in cottage industries.*





*Fish: one of the few affordable sources of protein in many countries.*

The results should help reduce the country's imports of rattan and assure the economic viability of cottage industries.

In Malaysia, too, rattan is a major source of rural employment, providing jobs for more than 50 000 aborigines, and the raw material for an important cottage industry and export trade. But supplies from natural forests are diminishing and it has been difficult to establish plantations because of the lack of good-quality seeds. A project at the Forest Research Institute (FRI) will develop tissue-culture techniques to produce high-yield, disease-free plantlets for the mass propagation of commercial rattan. In Malaysia, a few years ago, the Information Sciences Division funded the creation of a regional information service on rattan at FRI. The Centre has now made much progress on storing and disseminating valuable research literature on rattan, a subject previously largely ignored in spite of its economic importance for millions of rural dwellers.

IDRC's sustained, multi-sectoral project involvement in bamboo—rattan research is a good example of focused funding support to foster the application of science and technology for development.

### *Fisheries—Balancing the Food Equation*

In many developing countries, fish is one of the few affordable sources of protein. But serious obstacles must be overcome before adequate supplies can be made available. Aquaculture is plagued by disease epidemics and the industry has little or no access to scientific literature, and much fishing, particularly in Africa and Latin America, is artisanal and the catch falls far short of demand.

The intensive research support in aquaculture provided by the Centre's fisheries program over the past 10 years has generated important research results. A project in the Philippines led to the





*IDRC's Information Sciences Division supports projects to increase the information capability of fisheries institutions.*

first-ever successful breeding of milkfish in captivity and has had implications for the whole of Southeast Asia, where the milkfish is enormously popular for its taste and high nutritional value.

Before national governments can commit large investments to aquaculture, however, much more must be known about major fish diseases and parasites. Increased stocking densities mean increased exposure of fish to health hazards, vast areas of successful aquaculture ponds could be quickly wiped out. A major project in the Philippines will identify pathogens and their epidemiology, establish a central fish-disease laboratory, and train core staff in research procedures. The work, to be conducted by the Philippines Bureau of Fisheries and Aquatic Resources, will greatly strengthen the IDRC-supported project network on fish disease in the region.

The fisheries sector of most coastal countries in Latin America is underde-

veloped. Colombia, for instance, in spite of its extensive coasts on the Pacific Ocean and Caribbean Sea, must import more than \$65 million (US) of fish products each year. With support from IDRC, COLCIENCIAS, an agency created in 1968 under the Ministry of Education, will update its array of information on fisheries resources to prepare a pilot development plan for the country's small-scale fisheries. The agency will also devise a practical model of fisheries development for small communities along the country's extensive coastlines.

The Centre's Social Sciences Division actively supports research into the development of artisanal fisheries. In Senegal, a country that faces worsening food shortfalls because of the unrelenting drought and rural – urban migration that depletes the agricultural work force, the Division has funded a project in the Casamance region in the southern portion of the country. Here, as rainfall has



decreased, the salinity of the water in the fish-rich marshland has risen and now threatens a vital food source. The project will explore the relationship between fishing and agriculture in Casamance, the ways in which local people manage fish and farm resources, and how conflicting demands for limited fisheries resources by different ethnic groups can be reconciled.

In Chile, a project is looking at several small coastal fishing communities. Researchers are examining fishermen's organizations, as well as ways to improve fishing technology and access to credit facilities. Chile's fisheries sector directly employs from 30 000–40 000 artisanal fishermen. But low-level technologies in both capture and processing, unstable income, and lack of credit and marketing infrastructures prevent the country's extensive marine resources from being exploited to their full potential.

In Paraguay, the Division has funded a project to study the development of the country's fisheries over the past decade. In sharp contrast to other sectors of the economy, fishing has experienced dramatic growth in the past 10 years. However, in most cases, current catches are significantly below estimated potentials and the country is not able to meet international demand for its fish products. Future policy positions will require in-depth knowledge of the sector to assure continued growth. The results will be of interest to other Latin American nations that wish to develop their fishing industry.

IDRC's Information Sciences Division is supporting a number of projects designed to greatly increase the information capability of fisheries institutions in developing countries. One project will allow the International Centre for Living Aquatic Resources Management (ICLARM), located in the Philippines, to



*Small-scale farmers need the protection offered by community organizations.*

provide fisheries scientists throughout Southeast Asia and the Pacific with access to data bases from outside the region. Another will enable the Southeast Asian Fisheries Development Center (SEAFDEC) to create a specialized information analysis centre on brackish water species (BRAIS). Another SEAFDEC project will create the Southeast Asian Fisheries Information System (SEAFIS) to enable the region to participate in the global fisheries information network coordinated by FAO. This concerted and highly



focused funding support by the Division in Southeast Asia is a major step in its program of fisheries information. It is expected that similar coordinated support will be undertaken in other developing regions.

### *Change Through Action*

Providing a framework for effective social action to better the lives of rural dwellers can be done through cooperatives and similar organizations. Even the harshest critics of cooperatives admit that they do afford small-scale farmers and peasants a measure of protection against exploitation. Projects funded by the Social Sciences Division have looked at the role of peasant community organizations in Colombia, Ecuador, and Peru. But it is also necessary to understand how the interests of large landholders and farmers can influence national policymakers and so impact on the less advantaged sector of rural society. One project will look at the structure of organizations that represent

large agricultural producers in Brazil and Chile. The knowledge yielded will help peasant organizations and church and other groups concerned with promoting the welfare of the rural poor.

Another key agent for social change is agrarian law. The Social Sciences Division has funded a project in Indonesia to look at the possible role of agrarian law in fostering agricultural and rural development and in protecting the rural poor and the landless. Researchers at the law faculty of Hasanuddin University are looking at the production-sharing agreements between landowners and tenant tillers in rice-growing areas in South Sulawesi and traditional laws and their implications for national rural development policies.

# COMMUNITY AND FAMILY — THE HUMAN BOND

THERE is a human dimension to the rural experience that is as powerful as the rural dweller's mystical relationship to the land. The bond that unites families and communities in an ethic of mutual help is rooted in the reality that one cannot survive alone. This is seen in the ancient customs and rituals that punctuate work and play and help to create a virtually indissoluble communality. It has been observed, for instance, that villagers who move to large cities will cluster in clearly demarcated areas and for years retain a fierce loyalty to their villages and to each other.

Cultivation, of course, is a group responsibility, not an individual one; many hands are needed to sow, weed,

and reap. The nuclear family is rare in rural life; it is better to live in extended families, sometimes including several generations. In such arrangements, the child is a source of pride and joy; in a few years, a pair of strong hands in the fields and security for parents in their old age. Security through children may, though, be related to one of the major problems in developing countries — the high rate of population growth. But population growth is far from being a simple or unidimensional phenomenon, and the causal direction in its relationship with poverty is not at all clear.



*In developing countries, some 5–10 million children under the age of five die each year from diarrhea.*



## Preventing Life

Clearly, one way to reduce the need for many births is to reduce infant and child mortality. The maternal and child health program of the Health Sciences Division is concerned with one of the services that the industrial world more or less takes for granted — the provision of adequate health care to mothers and children.

In developing countries, the most common health problems of children are due to communicable diseases, especially diarrheal and respiratory diseases. It is estimated that in Africa, Asia, and Latin America some 750 million children under the age of five suffer from diarrhea each year. Some 5–10 million die from it. The major factors implicated in diarrheal diseases are malnutrition, poor hygienic facilities and practices related to water supply and sanitation, and the presence of pathogenic organisms. In Kenya, as in many other developing countries, studies on diarrhea have been hospital-based and have not evaluated rural control programs. IDRC has provided funding support to Kenya's Medical Research Institute to extend diarrheal research into a rural community and evaluate different community-based control strategies. The result may be a significant step in advancing knowledge about one of the developing world's most serious public health problems.

In Honduras, researchers working on a similar project will investigate the epidemiology of diarrhea in a rural area and provide important information for planning appropriate intervention and control programs. It is believed that 25 percent of all childhood and infant deaths in Honduras are related to diarrheal disease, and the problem is particularly acute in the rural areas where 70 percent

of the country's people live. The data will be relevant for other countries in Central America.

Earlier support provided by the Information Sciences Division enabled the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) to establish an International Diarrhoeal Disease Information Service and Documentation Centre (DISC). The ICDDR,B is now the preeminent institution in the developing world on diarrheal research. The Dhaka-based Centre plans to establish outstations in Africa and Latin America to expand considerably the geographical reach of its information activities.

Another cluster of IDRC projects concerned with maternal and child health focuses on the now well-documented benefits of breastfeeding. In countries where the supply of safe drinking water is limited and adequate nutrition uncertain, breastfeeding takes on tremendous significance. A project in the Philippines will promote breastfeeding among rural women in low-income groups with a view to developing a model that can be adopted by the Ministry of Health for widespread use. In the Dominican Republic, researchers will undertake a similar project and design an education program that can be applied throughout the country. In Thailand, researchers will investigate the effects of different breastfeeding patterns and the timing and nature of supplementary feeding on infant growth.

The Health Sciences Division, as are other divisions of IDRC, is concerned with the utilization and application of research results on a regional and even an international scale. In Colombia, the

Rural Health Development Program conducted by the multidisciplinary Research Centre for Rural Development (CIMDER), an organization that arose out of a project supported earlier by the Division, has had a major impact on primary health care programs in rural areas throughout the country. The program has now begun to have measurable influence on the delivery of primary health care in other countries in Latin America, especially in Bolivia and Ecuador where some of its key components have been replicated. Continued funding will enable CIMDER to strengthen its regional research centre

and continue developing and testing its rural health model. It should also give it the international credibility and visibility necessary to ensure multiple funding sources for future activities.

### Safe Drinking Water

By 1990, some 1.8 billion people in developing countries (excluding China) will require new, clean water supplies. Almost 1.4 billion — 78 percent — will be living in rural areas. It has been estimated that 20 million or more hand-pumps will be needed by the year 2000. As many as 2.5 million replacement pumps will also be required.

Since 1976, IDRC has been supporting research on the design of a simple, low-cost, shallow-well PVC pump. The piston and foot valve assembly were designed to be interchangeable to save



*Water: by 1990, almost 1.4 billion people in rural areas will require new, clean water supplies.*



labour costs in their manufacture, simplify maintenance, and keep the required number of parts to a minimum.

Later, IDRC supported research groups in several African and Asian countries to field test the pump. Trials were undertaken in Ethiopia, Malawi, Malaysia, the Philippines, Sri Lanka, and Thailand. The design was then modified according to the availability of local materials.

The second round of IDRC-supported research includes projects in all of the above countries except Malawi. In Ethiopia, where it is estimated that only 4 percent of the rural population has access to adequate and safe water supplies, more than 100 handpumps will be manufactured and field tested. And, of particular significance for developing countries where women are usually responsible for the supply and use of water, village women will be trained to service and maintain the pumps. The project in Sri Lanka will have a similar component. The Sarvodaya Shramadana Movement, a national nongovernmental organization that promotes community organization and self-reliance, and has already been involved in field testing the PVC pump, will train women to manufacture and maintain the handpump in villages throughout the country.

Handpumps alone will not ensure a supply of safe drinking water everywhere. New technologies designed to meet specific geographical and other conditions must also be developed. One priority, for instance, is simple and low-cost water disinfection methods, particularly for scattered rural populations. In northern Thailand, where over 90 percent of the population must drink water from polluted sources, a project will look at solar irradiation as an inexpensive means of disinfecting drinking water and will

establish design criteria for a device that can be operated and maintained by villagers.

### Modernizing the Rural Economy

Though the economic basis of rural life is agriculture, development strategies must aim at modernizing every facet of the rural economy. As the OECD has pointed out: "Agricultural progress must be accompanied by progress in craftsmanship, by steps towards industrialization within the context of the rural world, and by establishing related activities, e.g., by setting up repair workshops, in order to provide employment and increase rural incomes."

In both rural and urban areas, handicrafts employ millions of people. In India, for example, at least 8 million people are directly involved in handicraft production. These industries earn large quantities of foreign exchange through overseas exports and domestic sales to tourists. Thailand exports over \$300 million (US) to overseas markets, the Philippines sells at least \$150 million (US), and India's handicraft exports total over \$1.35 billion (US), or 20 percent of its total foreign trade.

Crafts-making is often undertaken by people with little or no land who must seek work outside of agriculture. The industries employ large numbers of women and tribespeople, groups that are usually the most difficult for development agencies to reach. Policymakers are more aware than ever of the benefits of a vigorous crafts sector. However, constraints on the growth of these industries need to be identified and removed through appropriate policy measures.

During 1984–1985, IDRC's Social Sciences Division is funding crafts research in Indonesia, Malaysia, Nepal, the Philippines, Sri Lanka, and Thailand. Research teams will link up with others to expand this network still further in Asia and, at some future stage, to involve countries in Africa and Latin America.

The Asian network represents the most comprehensive research program on crafts ever undertaken anywhere. Results will be disseminated through reports published within the participating countries and through national policy dissemination workshops. An international workshop is planned for late 1985 to which policymakers, researchers, and international agencies active in the field will be invited.

### Rural–Urban Migration

The issue of rural–urban migration is tremendously important in developing countries. They are being increasingly deprived of the human resources they must have to build a strong agricultural economic base to reduce food deficits, and at the same time they must cope with the problems generated by the very rapid growth of their cities. Throughout sub-Saharan Africa, cities have been growing at a frantic pace. In Zambia, for instance, the proportion of people living in urban areas more than doubled from 20.5 percent, in 1963, to 43 percent in 1980.



*Crafts-making is often undertaken by people with little or no land who must work outside of agriculture.*

Over the same period, the urban population in Chipata District in the Eastern Province more than tripled. Funding support from IDRC will enable Zambia's National Commission for Development to study the dynamics of rural–urban migration in Chipata. The results will help formulate guidelines for similar studies elsewhere in Zambia.

An issue of considerable interest to development specialists, and certainly to the families of migrants, is the effect of remittances from international and national labour migrants. It is generally agreed that remittances from urban to



rural areas can be effectively used for education, investment in small businesses, housing, agricultural development, and for the provision of other social services such as water supply and health centres.

In Kenya, where rural development is a crucial priority but severe constraints in public sector spending have curtailed the state's efforts to improve rural living standards, locally initiated community welfare organizations (CWOs) have emerged. They draw heavily on remittances from migrants to urban areas to provide farm credit and improve the overall agricultural picture.

The first phase of an IDRC-supported project documented the importance of remittances in checking deteriorating economic conditions in Kenya. In the case of the poorest rural households,

remittances accounted for over 90 per cent of total household income. In a second phase, the project will describe the nature and level of community-level remittances and assess the impact of CWOs on rural development at the community and household levels.

### *Studying Success*

It is important that rural development successes be studied closely to guide efforts elsewhere. India is a case in point. Its rural development experience is one of the richest and most varied in Asia. It was one of the first developing countries to address development problems directly and emphasize technological breakthroughs to increase agricultural productivity. With some 21 agricultural universities, 30 agricultural research institutions, and vastly increased levels of food



*Rural development: participation of people affected by programs is necessary.*



production and stockpiling, India has achieved something of an agricultural miracle. A project supported by the Social Sciences Division will enable six distinguished Indian academics and promising young scholars to examine rural development experiences in India. They will assess the effectiveness of different approaches and policies, and their relevance for present rural strategies in India and other Asian countries.

### Participating in Development

Rural development can only work if rural dwellers participate actively in planning and implementing programs that will affect their lives. In Sierra Leone, a joint project between Cooperative Programs and Social Sciences involves the participation of small-scale farmers in the identification of rural development problems and the sources of indigenous agroecological knowledge they use to solve these problems. A particularly innovative aspect of the project will be the use of a highly successful work-oriented Functional Adult Literacy Program (FALP) set up in some 50 villages by Canadian University Services Overseas (CUSO). FALP consists of classes held three times a week at which key words that come up during discussion of local problems serve as focal points for literacy instruction.

### The Role of Women

Much progress is being made in recognizing the important role played by women in development. As our knowledge advances about their contribution, it is difficult to understand in retrospect why development specialists neglected the significance of a contribution that is now so apparent.

In most households, the woman is the first one up in the morning. She makes a fire to boil water for tea or coffee, milks

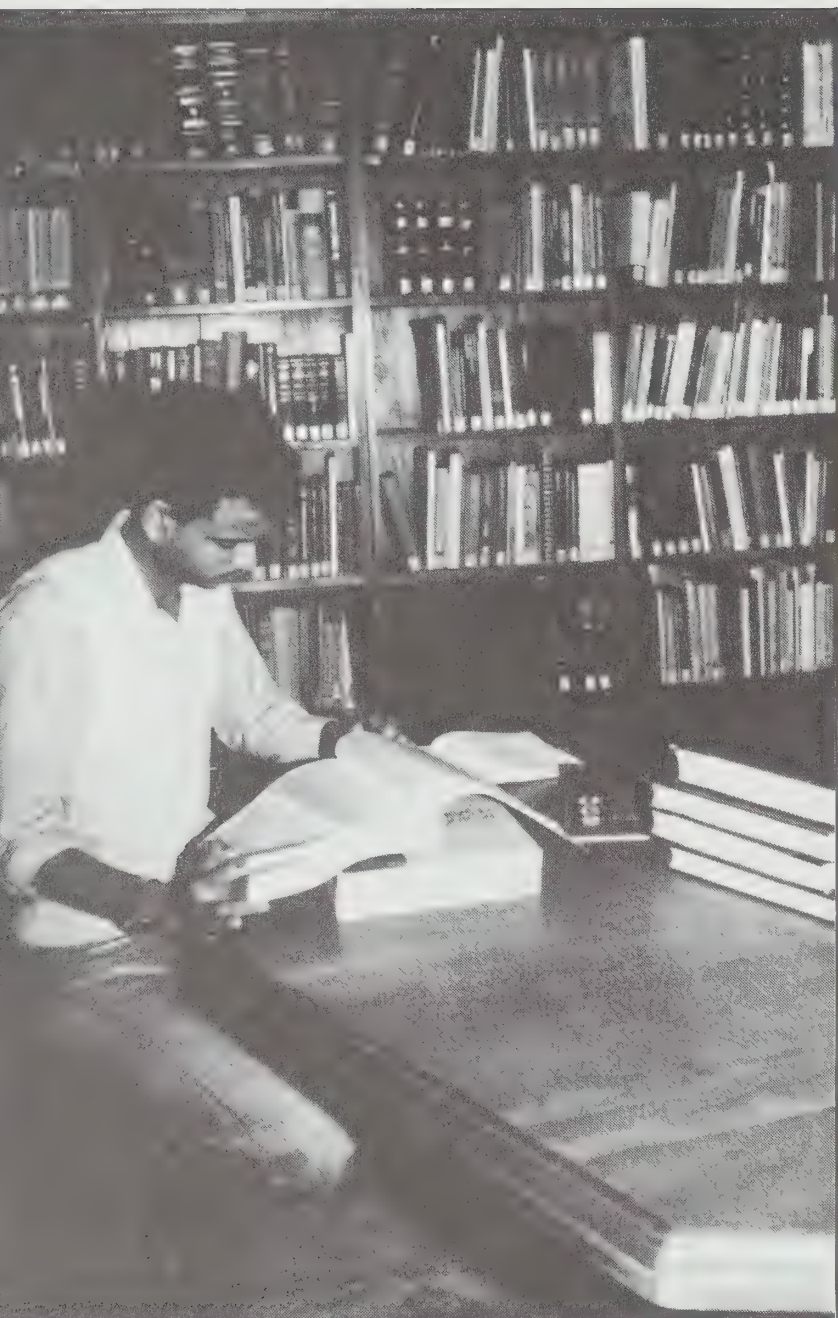


*We now know much more about the important role women play in development.*

the cow or the buffalo, and sends the daughter off to fetch water and wood from sometimes quite far away. In the Sudan, Nuba women cultivate the land from start to finish. In Java, they do most of the rice transplanting, weeding, and harvesting. It is women who make up much of the agricultural labour force in developing regions.

In countries such as Zimbabwe, where years of war have dislocated many rural people, women are now returning to farming and they will continue to play a major role in subsistence agriculture and cash-crop production. However, conditions have changed dramatically, individual peasant plots having been largely abandoned in favour of communal farming. Women must have training to help them adapt.





*"The best aid to give is intellectual aid, the gift of useful knowledge." (E.F. Schumacher)*

IDRC has for some time acknowledged the importance of strengthening the capacity of women to analyze their own educational requirements. It has supported a network of women researchers in each of the major regions of the world to pull together their often very isolated experiences in adult education. In Zimbabwe, a project supported by the education program of the Social Sciences Division is reviewing the experiences of developing countries in Africa and elsewhere in the rural resettlement of women. The project will help in the planning of a comprehensive program of women's education for pilot implementation in one resettlement area.

## Training for the Future

A long-term view of development encompasses facets often ignored when the concern is primarily with immediate results. The training of young scientists and scholars is a case in point. Setting up a solid foundation on which to build a research infrastructure that will allow a country to define its own objectives and policies is a form of long-range aid that cannot be readily assessed and quantified. But it may be the most important form of development assistance. This is why economist and thinker E.F. Schumacher often said: "The best aid to give is intellectual aid, the gift of useful knowledge."

The support provided by IDRC's Fellowships and Awards Division (FAD) aims at helping developing countries acquire human capital — researchers, managers, planners, and administrators. A project in Bhutan, supported by AFNS and mentioned earlier in this document, will seek to increase the country's rice production. A companion training project will help ensure that local scientists can sustain a long-term research effort to meet the country's needs.

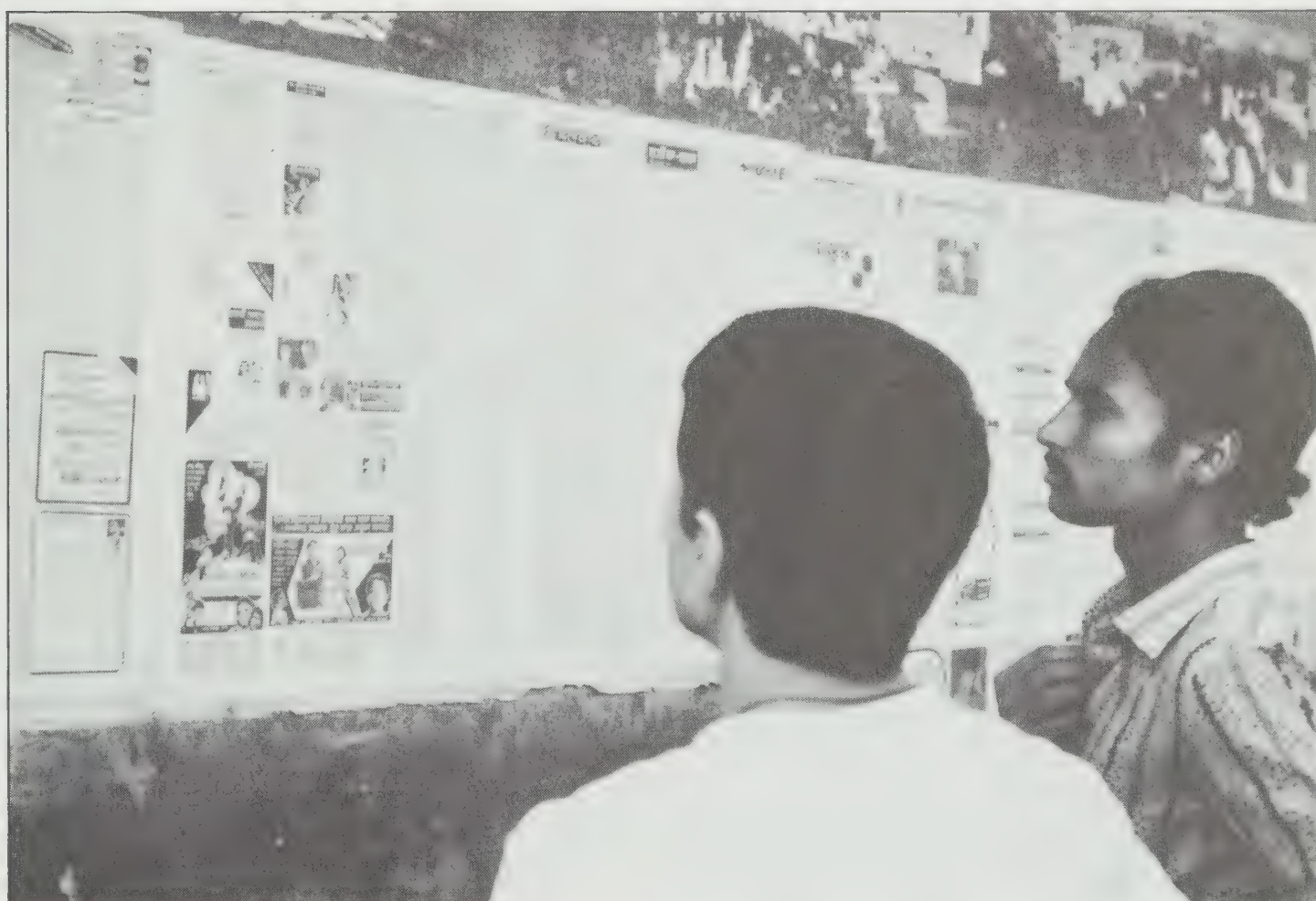
Another highly successful project, based at the National University of Singapore, has set up a course to train managers in forestry research and development and to build an institutional capacity within the region to provide such training on a continuing basis. Participants came from Bangladesh, Burma, China, Fiji, India, Indonesia, Malaysia, Nepal, Pakistan, the Philippines, Papua New Guinea, Sri Lanka, and Thailand.

The politics of rural neglect make it hard for researchers operating outside of major urban centres to obtain the funding necessary for their work. An imaginative project by the Social Sciences Division will provide awards to provincial universities in Peru to enable rural-based researchers to undertake policy-relevant studies in the area of economics and rural development. An innovative component of the project is that awardees will be ensured contacts with senior social scientists and officials in Lima as they carry out their studies.

### In the Age of Communication

Without effective communication, rural development is not complete. Rural dwellers have to break out of their isolation if they are to finally become part of the larger economic sphere. Print and other media have played a catalytic role in the building of modern societies and their importance will be just as great in countries whose development must rest on functional literacy. Media entertain, but they also inform. They can make it possible for policies to be discussed, for the web of knowledge to spread and include those who are neglected and alienated.

IDRC's Communications Division supports projects that will improve the



*Media inform, make it possible for policies to be discussed.*



ability of print and other media in developing countries to enhance public awareness and understanding of the role of science and technology in national development. In a joint effort with IDRC's Cooperative Programs Division, support from the Communications Division enabled the Canadian Broadcasting Corporation (CBC) and the Asia-Pacific Institute for Broadcasting Development (AIBD) to collaborate on an intensive 3-week training course for radio professionals in Asia and the South-Pacific. As a result, 16 people actively engaged in science radio programming, including a radio instructor from the Caribbean, were trained.

IDRC also assists national research centres to communicate research results. For example, one project helped Thailand's Department of Agricultural Extension, with assistance from Kasetsart University, to conduct a 5-week communications training course for extension officials on the use of communications media to support agricultural extension.

The education program of the Social Sciences Division also supports research on the use of mass media in reaching rural populations living in scattered and isolated settlements. The use of educational radio, for example, has been increasing in many countries of Latin America, especially Peru, Bolivia, and Ecuador. In Peru, where many peasants are illiterate and speak Quechua, radio programming in their native language is an important window on the world. Researchers in one project will look at ways to incorporate Quechua songs, a vital element of popular culture, to enhance the appeal of radio programs dealing with topics such as modern agricultural and health practices.

In another related project in Peru, a study by the Centro Peruano de Estudios Sociales (CEPES) will look at ways of

improving educational radio programming aimed at rural populations. A previous IDRC-supported project conducted by CEPES looked at the evolution of radio programs in Peru and programming alternatives such as listener participation. Another project will now examine, specifically, the impact of peasant participation on such programming.

# WHAT IS IDRC?

THE International Development Research Centre (IDRC) is a corporation created by the Parliament of Canada in 1970 to stimulate and support scientific and technical research by developing countries for their own benefit.

The fields of investigation to which IDRC gives its financial and professional support include: farming; food storage, processing, and distribution; forestry; fisheries; animal sciences; energy; tropical diseases; water supplies; maternal and child health; education; population studies; economics; communications; urban policies; science and technology policy; and information systems.

Although IDRC is funded entirely by the Canadian Parliament, to which it reports annually, its operations are guided by an international 21-member Board of Governors. Under the IDRC Act, the chairman, the vice-chairman, and nine other governors must be Canadian citizens; in practice, 6 of the remaining 10 governors are from developing countries.

The Centre's programs help developing countries to build the scientific competence of their institutions and their researchers so that these countries can work to solve their own problems. Opportunities are given to researchers to broaden their experience through further specialized study or on-the-job training.

IDRC emphasizes the role of the scientist in international development and encourages Third World countries to draw on the talent of their own scientific communities. Building a strong local base for future research is an important objective of most IDRC-supported work. Research projects are identified, designed, conducted, and managed by developing-country researchers in their own countries, to meet their own priorities.

IDRC helps to create and supports international research networks through which developing countries can learn from each other, share common experiences, and conduct similarly designed studies in areas of mutual concern. It also promotes cooperation between developing-country researchers and their counterparts in Canada.

## Areas of Support

**Agriculture, Food and Nutrition Sciences** — In this group of related sciences, emphasis is on farming systems, social forestry in arid and semi-arid lands, and aquaculture. Specific areas of support include: previously neglected food sources such as root crops, food legumes, and oilseeds; agroforestry (growing trees and crops together); multiple cropping systems; improvement of pasture lands; use of non-conventional feeds for animals; fish and shellfish farming; post-production systems for the protection, processing, and distribution of food crops, fruit, and fish; and the economics of small-scale farm production and marketing.

**Health Sciences** — The division's support is concentrated in five broad areas of applied research: water supply and sanitation; maternal and child health; tropical and infectious diseases; occupational and environmental health; and health services research.

**Social Sciences** — Research supported by the division is designed to improve understanding of the social and economic issues related to international development, permitting researchers and policymakers to formulate policy options in several thematic areas. These include: education; population; science and



technology; energy; urban development; economics; and rural development. Support is also given to a limited number of national and regional institutions in the social sciences, and to research on problems of special regional concern.

Energy — The worldwide effects of unstable energy supplies and prices in recent years have underlined the urgent need for increased research on the energy problems of those most adversely affected — the developing countries. One of IDRC's major activities in this area has been the coordination of an international Energy Research Group comprised of 10 energy analysts and policymakers from developing countries. Funded jointly by IDRC and the United Nations University in Tokyo, the Group is working to identify energy research priorities for developing

countries and to suggest how national, regional, and international research resources can be better allocated.

### Information Program

Information Sciences — Support given by the division helps developing countries to: establish regional and national information systems and improve library infrastructures at these levels; participate in international information networks; create specialized information centres (serving the region or world) on development-related subjects; strengthen sectoral information programs, especially in agriculture, health, population, industry, the environment, cartography, and social issues; and develop information tools and methods. The division's computer systems group provides internal ser-



*An IDRC project-identification workshop in China.*

vices and distributes MINISIS, a bibliographic software package designed by IDRC, to developing countries. In addition, a library and micrographics unit serve IDRC staff, the Canadian development community, and IDRC-supported projects.

**Communications** — Services provided by the division include: the publication and dissemination of the results of IDRC-supported research via print and film media; public affairs; and translation. The division also supports projects aimed at strengthening the ability of research institutions and communications media in developing countries to prepare and disseminate scientific and technological information.

### *Collaborative Programs*

**Cooperative Programs** — The division promotes collaboration between scientific research groups in developing countries and their counterparts in Canada — whether academic, governmental, or private. By establishing channels of communication among scientists, the division helps improve the transfer of research results from Canada to the Third World. However, project support is open to all disciplines that contribute to Third World economic or social development and in which there is recognized Canadian expertise. It is important that the developing-country research group play a significant role in formulating a scientifically sound project proposal and in planning and executing the project, thereby strengthening its research capacity.

**Fellowships and Awards** — The division funds the training of junior and senior Third World scientists, managers, and planners working in sectors covered by IDRC's program divisions. Preference is given to individuals from the least

developed countries and the emphasis is on professional upgrading rather than basic training. In addition, the division supports practical, non-degree group training to improve technical, research, and administrative skills of individuals. A portion of the division's funds is also used to encourage the involvement of young Canadian researchers in scientific areas of concern to IDRC, and to expose them to the problems of the developing world. These doctoral students are posted to a Third World country for studies, research, or placement.



## Funding and Selection of Projects

Each program division channels funds to institutions in developing countries (government departments, universities, research centres, etc.), to international and regional institutions, and to Canadian institutions. The recipient is expected to pay a portion of the costs.

All projects are reviewed by IDRC's professional staff and assessed in light of factors such as:

- Development priority: Is the proposal consistent with national or regional development goals?
- Regional applicability: Are the research findings likely to be applicable in developing countries or regions other than the one in which the research takes place?
- Usefulness: Will the research help close gaps in living standards or lessen the imbalance in development between rural and urban areas?
- Local resources: Will the project make full use of local resources and research workers from the region?
- Training: Will the project result in better trained and more experienced researchers and more effective research institutions?
- Research area: Does the research fall within IDRC's areas of concentration?

When IDRC agrees to support a project, it enters into an agreement with the developing-country institution. In it are stipulated the project's purpose, research methods, payments, and a schedule for the research and progress reports.



*Some of the members of IDRC's projects committee review proposals.*

## The Program Officer

Though IDRC itself rarely undertakes research, its program officers are highly-qualified professionals. One of their main functions is to respond to project ideas proposed by developing-country researchers and to evaluate the suitability of proposals in light of the criteria stated above.

Once a project has been approved in principle, the program officers collaborate with the institution submitting the proposal in further refining the project idea, provide administrative and technical advice, and help in preparing a project budget. Program officers are based either at IDRC headquarters in Ottawa or in one of the regional offices. In the regions, they help determine research priorities and prepare detailed annual plans of projects to be defined and developed, workshops and seminars to be organized, and maintain contact with research institutions throughout the region.

## Project Approval

Before funds are appropriated, a project proposal must go through a formal approval process.

Authority to approve projects for which funding exceeds \$100 000 (CAD) lies with IDRC's Board of Governors. It delegates approval authority to the President and the Vice-Presidents for projects up to \$100 000, to Directors of individual divisions for projects up to \$50 000, and to Deputy Directors for projects up to \$15 000.

When a project has been approved, funds are appropriated by the Office of the Comptroller General and Treasurer. The Secretary's Office prepares a Memorandum of Grant Conditions (MGC) governing all aspects of the relationship between the signing parties. Once the MGC has been signed by the recipient, funds can be forwarded.



# PUBLICATIONS AND FILMS

## Books

**IDRC annual report 1983–1984/Rapport annuel CRDI 1983–1984.** 77 p. IDRC-003/84e,f

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**Coming full circle: farmers' participation in the development of technology.** P. Matlon, R. Cantrell, D. King, and M. Benoit-Cattin. 176 p. IDRC-189e

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**Organización y conflicto: la educación primaria oficial en Colombia.** H. Gómez-Buendía y R. Losada-Lora. 319 p. IDRC-199s

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**Pompes à main communautaires: recherche et évaluation en Asie.** D. Sharp and M. Graham. 80 p. IDRC-204f. *(Also available in English IDRC-204e and Spanish IDRC-204s)*

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**Toxicidad de la yuca y tiroides: aspectos de investigación y salud.** F. Delange y R. Ahluwalia. 152 p. IDRC-207s. *(Also available in English IDRC-207e)*

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**Le logement élémentaire: viabilisation et habitat dans les pays en développement.** A.A. Laquian. 176 p. IDRC-208f. *(Also available in English IDRC-208e)*

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**Les contextes de recherche en éducation dans les pays en développement.** S. Shaeffer et J.A. Nkinyangi. 290 p. IDRC-213f. *(Also available in English IDRC-213e)*

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**Crop improvement in Eastern Africa: research objectives and on-farm research; a regional workshop held in Nairobi, Kenya, 20–22 July 1983.** R.A. Kirkby. 122 p. IDRC-218e

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**Social scientists in agricultural research: lessons from the Mantaro Valley Project, Peru.** D.E. Horton. 67 p. IDRC-219e. *(Also available in French IDRC-219f and Spanish IDRC-219s)*

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**Searching: review of IDRC activities 1983.** 40 p. IDRC-220e. *(Also available in French IDRC-220f and Spanish IDRC-220s)*

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**Tropical root crops: production and uses in Africa: proceedings of the second Triennial Symposium of the International Society for Tropical Root Crops — Africa Branch held in Douala, Cameroon, 14 - 19 August 1983.** E.R. Terry, E.V. Doku, O.B. Arene, and N.M. Mahungu. 231 p. IDRC-221e

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**SALUS: low-cost rural health care and health manpower training : an annotated bibliography with special emphasis on developing countries.** Volume 11. R.M. Bechtel. 134 p. IDRC-222e

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**Devindex 1983: index to selected literature on economic and social development/Index d'ouvrages sur le développement économique et social.** 222 p. IDRC-223e,f

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**Estrategias para el uso de residuos de cosecha en la alimentación animal: memorias de una reunión de trabajo efectuada en el Centro Agronómico Tropical de Investigación y Enseñanza, Turrialba, Costa Rica, 19–21 Marzo 1980.** M.E. Ruiz, A. Ruiz y D. Pezo. 159 p. IDRC-224s

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**SALUS: low-cost rural health care and health manpower training: an annotated bibliography with special emphasis on developing countries.** Volume 12. R.M. Bechtel. 137 p. IDRC-225e

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**Infant mortality and health in Latin America: an annotated bibliography from the 1979–82 literature (includes Spanish, Portuguese, and French entries).** M. Farren. 172 p. IDRC-226e

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**SALUS: low-cost rural health care and health manpower training: an annotated bibliography with special emphasis on developing countries.** Volume 13. R.M. Bechtel. 140 p. IDRC-227e

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**SALUS: low-cost rural health care and health manpower training: an annotated bibliography with special emphasis on developing countries.** Volume 14. R.M. Bechtel. 143 p. IDRC-228e

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**SALUS: low-cost rural health care and health manpower training: an annotated bibliography with special emphasis on developing countries.** Volume 15. R.M. Bechtel. 145 p. IDRC-230e

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**Rural university: learning about education and development.** F. Arbab. 71 p. IDRC-231e

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**Proyectos de viviendas urbanas de bajo costo: bibliografía anotada de investigaciones apoyadas por el CIID y el BIRF.** 64 p. IDRC-TS41s

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**Systèmes internationaux d'information socio-économique: étude d'évaluation des programmes de type DEVSIS.** W.O. Aiyepoku. 103 p. IDRC-TS43f. *(Also available in English IDRC-TS43e)*

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**Comunicación entre grupos: el método del cassette-foro.** M. Kaplún. 111 p. IDRC-TS45s

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**Educational research: the English-speaking Caribbean.** E.L. Miller. 199 p. IDRC-TS46e

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**Rearing of marine fish larvae in Japan.** K. Kuronuma and K. Fukusho. 111 p. IDRC-TS47e

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**Improving small-scale food industries in developing countries.** W. Edwardson and C.W. MacCormac. 167 p. IDRC-TS48e

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**Tropical timber for building materials in the Andean Group countries of South America.** F.J. Keenan and M. Tejada. 151 p. IDRC-TS49e

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**Management of information centres in China: results of a course held in Kunming, Yunnan Province, People's Republic of China, 6–18 December 1982.** K.P. Broadbent. 470 p. IDRC-TS50e

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## Magazine

### **The IDRC Reports/Le CRDI Explore/El CIID Informa**

This is a quarterly magazine of report and comment on the work supported by IDRC and on related activities in the field of international development. It is published in three separate language editions. Total circulation of the English, French, and Spanish editions is 23 000 per issue, of which 50 percent is to the developing countries, 25 percent within Canada, and the remainder to other countries.

## Film

### **Footholds**

For 300 years, the peasant farmers of Latin America have lived in poverty. They lack land, tools, and other necessary resources. Large-scale modernization schemes and so-called appropriate technologies have been of little benefit in their lives. "Footholds" documents how some Latin American research groups are discovering and understanding the interrelated and complex processes that explain the predicament of the peasants. These groups are designing and implementing education models, such as a rural university in Colombia, and showing how both new and old agricultural methods, such as those of the ancient Incas, can be revitalized to improve the peasant's well-being. The 29-minute, 16-millimetre colour film, shot on location throughout Latin America, was produced by IDRC's Communications Division.



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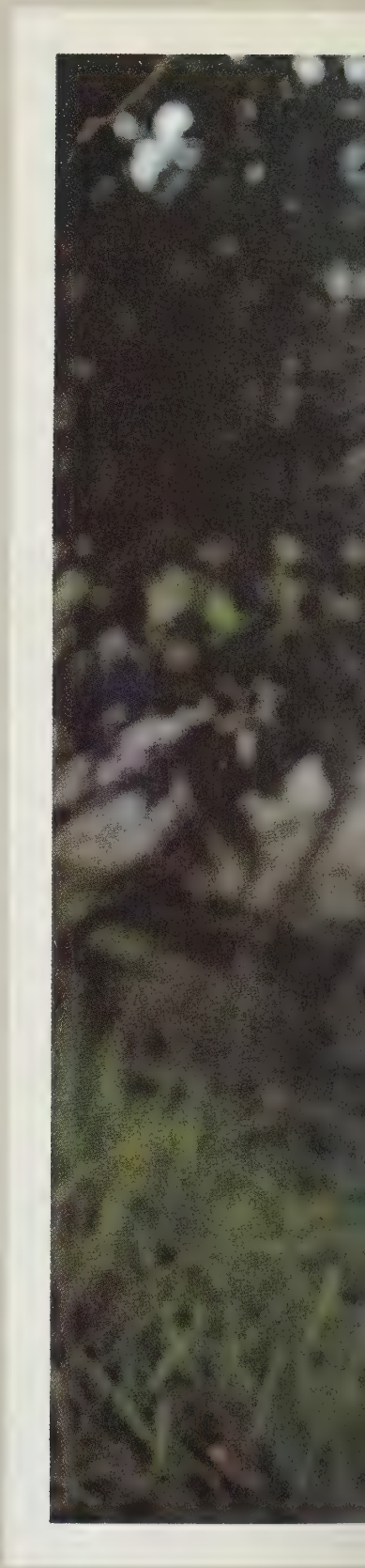
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# SEARCHING

Research: A Path to Development





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# SEARCHING

## Research: A Path to Development

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# INTRODUCTION

The year 1985 will surely always be recalled with horror as the year of disaster. The frequency and ferocity of so many natural events is likely without historic precedent. Tidal wave, drought, earthquake, flood, volcanic eruption, hurricane; all were present. The human species found itself challenged again and again by a seemingly endless array of furies of natural origin.

Yet if these events were natural in their beginnings, such was certainly not the case in their impact. In many of the incidents, death and destruction was increased by the intermediary of human acts, sometimes of omission, sometimes of commission. Whether it was failure to heed warnings, unwillingness to respect the cyclical pattern of certain events, or inability to diminish the impact of natural forces, the human factor was all too often a major influence in the multiplication of misery.

The grisly count of death and carnage spared no continent in 1985. Yet it was in the developing regions that the numbers soared: Bangladesh — tidal wave, 10000 dead; Mexico — earthquake, 7000 dead; Ethiopia — drought, hundreds of thousands of deaths; Colombia — volcanic eruption, 25 000 dead. The drought, floods, and blizzards that struck North America, Europe, and Australia in 1985 brought tragedy in their wake but in nowhere near the same numbers.

The reasons are clear. A country such as Canada is able to limit the effect of major storms through a sophisticated network of activities that permits effective early warning and mandatory evacuations of threatened areas. The design and construction of houses and buildings, of highways and bridges, assures escape from all but the most unlikely of natural events. The infrastructure of hospitals, relief agencies, food outlets, emergency transportation, and communication grids is able quickly to be harnessed for emergency purposes to limit quickly the impact of disaster. None of this is available in many developing countries. As a result, an event that is merely a nuisance in the North becomes cataclysmic in the South.

That much is indeed obvious and carries with it troubling moral questions. There are still more questions though, as puzzling in their nature as the disparities in death figures are disturbing. Why is the frequency of natural disasters apparently increasing?



*The plastic handpump is demonstrated for IDRC President Ivan L. Head in Malaysia.*



Why is the magnitude of their impact increasing? Why are developing countries most often the locus of the most serious of these events? What are the most effective remedial measures?

It is only recently that these and a host of similar questions have been posed. The data bases are as yet thin and often unreliable. They reflect in large measure the still inadequate research capacity of so many developing countries. The same inadequacy that hinders the governments of these countries in their efforts to increase food production, decrease infant mortality, extend literacy, and solve problems of myriad sorts. And so people continue to die needlessly. And in immense numbers.

It was that inadequacy that prompted the creation of IDRC 15 years ago, and that motivates its continued activity.

The solution of problems, and the enhancement of local competence — these remain the primary goals of the Centre. Whether it be the design of an improved village water pump, or the strengthening of regional and national research institutions, IDRC endeavours to respond professionally and effectively to genuine need.

The Centre, of course, is only one of many participants in a development process that has proved to be more complicated — with results more elusive — than was envisaged even 15 years ago. Attempts to improve living conditions in developing countries have been very effective in some instances, but not in all, and have sometimes given rise to effects not originally anticipated. This is equally true in the particular processes employed by IDRC in building research capacity and supporting research that contributes to the solution of development problems. Developing-country governments and donor agencies are looking constantly for better approaches, for more effective results.

*Searching* describes IDRC's efforts in these respects as it endeavours continually to respond imaginatively and effectively to demonstrated need.

In the pages that follow will be found discussions of that need.

Ivan L. Head  
President, IDRC

## International and Regional Research Institutions

The period since World War II has seen an unparalleled commitment to international cooperation. Initial enthusiasm for the development of multilateral institutions owed much to the experience of a World War and to the depression and international economic hardship that had preceded it. The growing number of countries attaining independence in the 1950s and 1960s, bringing with them aspirations for improvements in the living conditions of their peoples, encouraged the evolution of the existing system. Third World countries have been especially vocal in supporting the evolution of multilateral mechanisms as a critical element in assisting them to meet their national development objectives.

With 1985 marking the 40th anniversary of the United Nations (U.N.), the agencies of the U.N. system are particularly in focus. The World Bank and the International Monetary Fund (IMF) have taken on an increasingly prominent role with the continuing economic and financial crisis facing Third World countries. The General Agreement on Tariffs and Trade (GATT) continues to be the major forum in which discussions of trade expansion take place. The agencies of the U.N. system are, however, only the best known and most universal of a vast array of institutions and groupings that have been created by groups of countries coalescing around perceived common interests — trade groupings, political groupings — the ambition of many encompassing both these areas and more.

## Growth of Multilateral Institutions

Although the development of new

universal organizations has been halted since the International Fund for Agricultural Development (IFAD) was established in 1979, regional organizations are still being formed, expanded, or revitalized. In Africa, the Southern Africa Development Coordination Committee (SADCC) is perhaps the best recent example of a multilateral approach to a common set of problems. The Preferential Trade Area formed by 14 East, Central, and Southern African countries in July 1984 and the Economic Community of West African States (ECOWAS), formed in 1975, are other examples. Both the Organization of American States (OAS) and the Organization of African Unity (OAU) have provided opportunities for discussion of regional issues. The OAU summit meeting held in July 1985, while focusing on the poor economic performance of African countries, reaffirmed the importance of regional groupings to future prosperity, also a salient feature of the Lagos Plan. Four main regional development banks were established between 1959 and 1969 to organize and provide financing for major development projects in their region. In Asia, efforts at collaboration have been stepped up both within and outside organizations such as the Association of South East Asian Nations (ASEAN). This commitment to regional groupings has not detracted from organizations where membership is determined on different criteria such as the Commonwealth, which continues to grow as new countries become eligible for membership.

This impressive set of postwar multilateral institutions, regional and international, contributed to providing an environment in which some major achievements have been realized. This period has seen the largest burst of



sustained economic growth in human history and great efforts to alleviate poverty and pressing development needs. Gross national product (GNP) per capita increased on average by 3.1% per year in the developing countries between 1955 and 1980, whereas in the industrial market economies it grew by 3.6% from 1955 to 1970 and by 2.4% in 1970–80.

Important progress was made in developing countries with respect to social indicators such as literacy and child mortality. Clearly, however, all did not share in the fruits of economic growth. Although the 1960s allowed for a certain optimism and the hope that many developing countries would emulate the development of the industrialized countries, there was a growing sense of frustration in the 1970s engendered by the vast gap between the expectation of sharing in world prosperity and the reality of limited success. The call for a New International Economic Order — and discussion of issues in the global context of North–South relations — provided demands for change that were not easily or readily accommodated.

In the 1970s and 1980s, multilateralism has been under pressure for both economic and political reasons. There have been movements toward greater trade protectionism, although these have been challenged by proposals to liberalize trade further. This tougher international climate has directly affected most multilateral institutions because they depend in large part on funding from developed countries via Official Development Assistance (ODA) budgets. In its latest annual review of members' ODA (*Development Cooperation, 1984*), the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD) considers three views of the future: first, that recent problems in funding multilateral agencies will be followed by a resumption along the same lines as before; second, that these problems

“herald a reversion to the primitive situation of the early 1960s, when what was called ‘aid’ was no more than a conglomeration of widely differing activities, with widely differing objectives.” The review concludes: “So one is led to a *third* and brighter view, according to which the recent problems of funding have been sufficiently severe to force a review of the role of multilateral agencies, both individually and collectively without threatening their destruction (one or two agencies, notably IFAD, excepted).”

Whatever the specific value or need for change in particular institutions, there continue to be strong arguments for the maintenance and strengthening of a multilateral framework in which work can be undertaken on the growing number of issues that transcend national boundaries. Nowhere is this more true than in the field of research.

## Multilateral R&D Institutions

The multilateral approach has a particular attraction in the fields of science and research. The arguments in favour of international cooperation are here every bit as cogent as in other fields of economic and technical endeavour. Many of the problems being tackled by research are common to several countries and influence the lives of large numbers of people. No country, not even the largest and most advanced, can afford to ignore scientific discoveries and progress being made elsewhere. The scientific community and increasingly the public have become aware of the interdependence between nations and the role that science can be made to play in solving development problems. At the same time, there has been an increasing sense of the growing vulnerability of the whole planet to changes or threats to one part of the global system.

As might be expected, some major developments concerning multilateral



institutions and contacts have been those related to research. The International Development Research Centre (IDRC) has been a part of these developments and has played a role not only in supporting the activities of a number of the institutions concerned, but also in the establishment of several. With this involvement, there has been a growing realization that the full dimensions of the set of institutions concerned do not appear to have been widely recognized or documented. As a result, IDRC has recently been undertaking a survey to gather more information on them.

Nearly 300 institutions were initially identified that were based in developing countries and appeared to have a multilateral mandate and a direct role in undertaking or complementing research. No research-funding agencies were included. Although the survey is not yet finished, 192 institutions have now been confirmed, mostly by returns to a mail survey, as fitting the general criteria of the study.

The survey covered a heterogeneous array of research-related institutions. "Multilateral" was taken in most instances as meaning that an institution covers *at least three countries*, both in the sense of it owing its existence to the initiative of several countries or multilateral agencies and in having an objective of providing services to more than one country. These institutions are usually termed regional or international. "Multilateral" has been used here to cover both categories. Of the 192 institutions that have returned questionnaires, probably 30 could reasonably claim to have an "international" focus in terms of covering a number of geographical regions, whereas the remaining 162 were regional. This was not, however, a hard and fast line.

The IDRC survey includes both institutions that are directly involved in *conducting research* as their major purpose (the Asian Vegetable Research

and Development Centre and the Caribbean Industrial Research Institute, for example), and those that are *research complementing* by providing support services to research such as research promotion, training, information, and dissemination (for example, the Council for the Development of Economic and Social Research in Africa and the Arab Organization for Agricultural Development). Although a distinction has been made between these two groups in terms of their involvement in research, the institutions more properly belong on a spectrum. It is easy to distinguish between institutions at opposite ends of the spectrum in terms of their



*How many jobs are created by rural agroindustries like peanut processing? Planners are working to find out.*



role in research, but the dividing line between the two categories is not a hard and fast one. At present, 82 of the 192 institutions are classified as “conducting research” and 110 as “research complementing.”

The information collected to date is believed to be reasonably comprehensive and representative of the total. IDRC will publish a directory of institutions once the survey is completed. It covers only those institutions that are based in developing countries; those based in developed countries, such as the International Food Policy Research Institute (IFPRI), represent a significant additional number of institutions.

The total resources required annually for the activities of all institutions covered in the survey may be as high as \$1 billion. Those institutions involved in a major way with research account for about \$500 million, of which the International Agricultural Research Centres (IARCs) make up a little under half. The research budget of institutions involved less directly in research is a further \$75 million.

Research may not be a major part of the overall mandate of some of those organizations identified as “research complementing,” but, nevertheless, they play an important role in research developments and coordination in their regions. All institutions were asked to estimate the research portion of their budgets, although they have clearly done this using considerably different criteria. Some of the IARCs, for instance, report as little as 40% of their total budget as *research*, where for the purposes of the IDRC survey almost their entire budget might usefully be counted as research.

The institutions covered do not form any kind of global system, implying, as this term does, a rational and integrated set of activities, and the IDRC survey may be the first time that they have been analyzed as a group separate from other international and regional

institutions. Many owe their initial funding to initiatives of U.N. specialized agencies; others have been established to take care of a general or sectoral research interest under the umbrella of regional organizations having a primarily economic or political purpose. They range from the best known group — the IARCs with their common funding source through the Consultative Group on International Agricultural Research (CGIAR) to institutions that have been established in isolation from similar ones existing elsewhere. They vary also in size from a budget of less than \$50 000 to over \$20 million.

Given this marked heterogeneity, it is important to bear in mind that many of the institutions are small and cannot easily be compared to the best known of the multilateral research institutions. In spite of the imperfections of the data, however, the overall numbers, resources, and potential impact on national research programs in developing countries make it essential to carry out some common analysis and review of this group of institutions that has been identified as playing a role in research. This is particularly so from the point of view of donor organizations such as IDRC, because these institutions require a significant proportion of their funding from donor agencies and thus represent a substantial, “permanent” draw on ODA resources.

From a base of only five in 1945, the number of multilateral research-related institutions has grown rapidly to the present figure of over 200, with a peak number being established in the 1970s, when an average of eight new institutions were created each year.

Initial information indicates that this growth has dropped off markedly in the 1980s; although part of this perceived drop may be because of a lag in a new institution becoming established and well known, it clearly relates also to the prevailing shortage of funding and the increased questioning of the role of

multilateral organizations. In some cases, such as agricultural research, it may also be because of a feeling that the most important research areas are now covered by international centres. Figure 1 groups institutions by the date of their establishment.

Although the development of multilateral, research-related institutions has been global and of significance in all regions, the rate of creation is explained not only by the availability of resources for new institutions but also by the pattern and rhythm of countries achieving independence and wishing to form regional groupings and by timing of the arrival on the world "agenda" of various issues and problems (population, environment). The growth in the 1940s and 1950s was focused in Latin America, that of the 1960s, however, came to some extent from all regions but increasingly from Africa and the Caribbean. The 1970s saw a marked increase in overall numbers, with particular concentration in sub-Saharan Africa. The number of such institutions in

a region is clearly related to the number of countries in the region and to the need and desire to form subregional centres or groups. Figure 2 shows the pattern of establishment by region; the rate of new creations for 1981–85 has been used to make a projection, assuming a constant rate for the decade, for the probable number to be established in the 1980s.

A sectoral breakdown of institutions indicates a concentration in agriculture and social sciences (see the following table and Fig. 3) with considerably less focus on health and industry. If education were included with the social sciences, the number of institutions in the agricultural and social sciences fields would be approximately the same.

As can be seen from the table, the global figures hide the fact of considerable regional variation; agricultural institutions are spread fairly evenly across the regions, although South and Southeast Asia and sub-Saharan Africa account for 72% of the total. Over half the social science institutions, however,

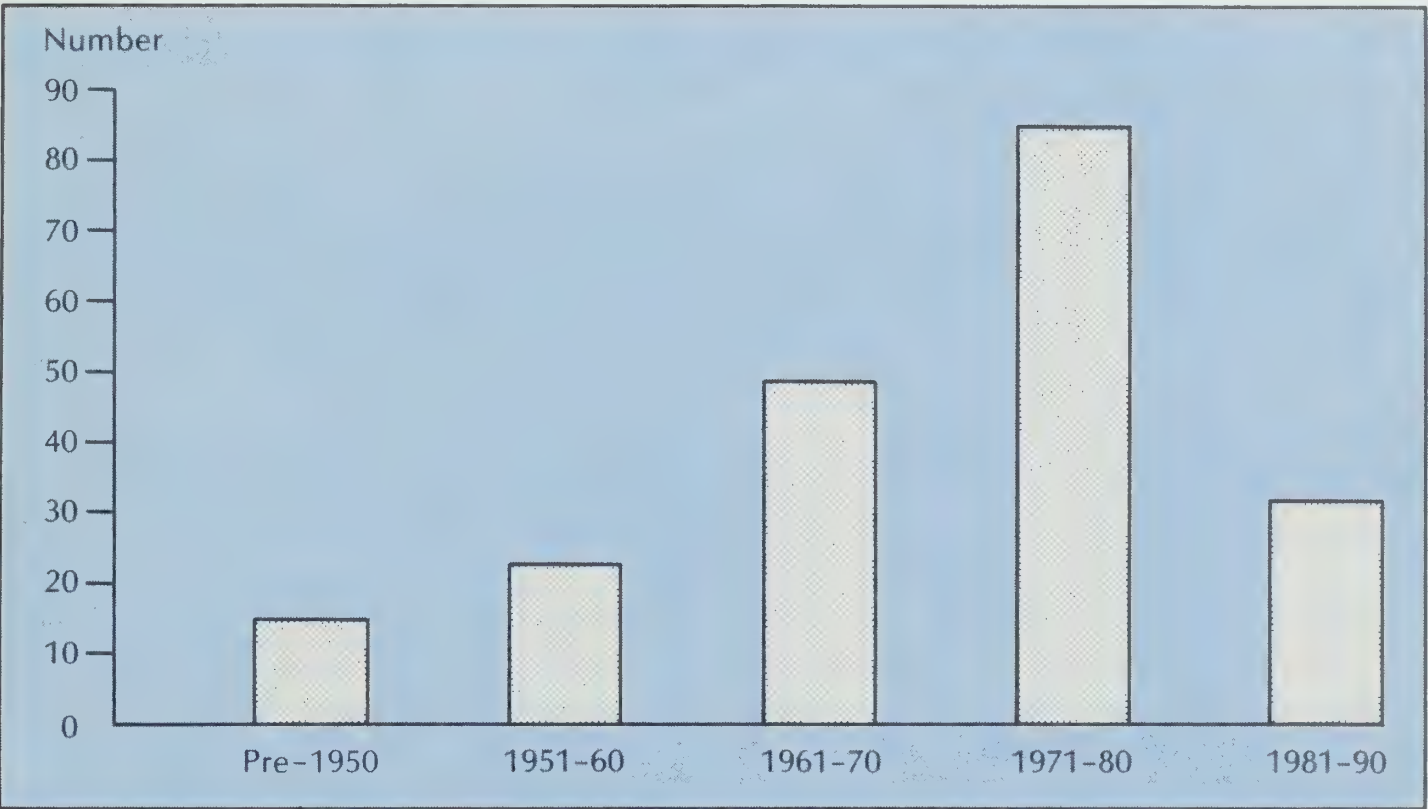


Fig. 1. Multilateral research-related institutions by year of establishment. (The projection for 1981–90 is based on 1981–85 experience.)



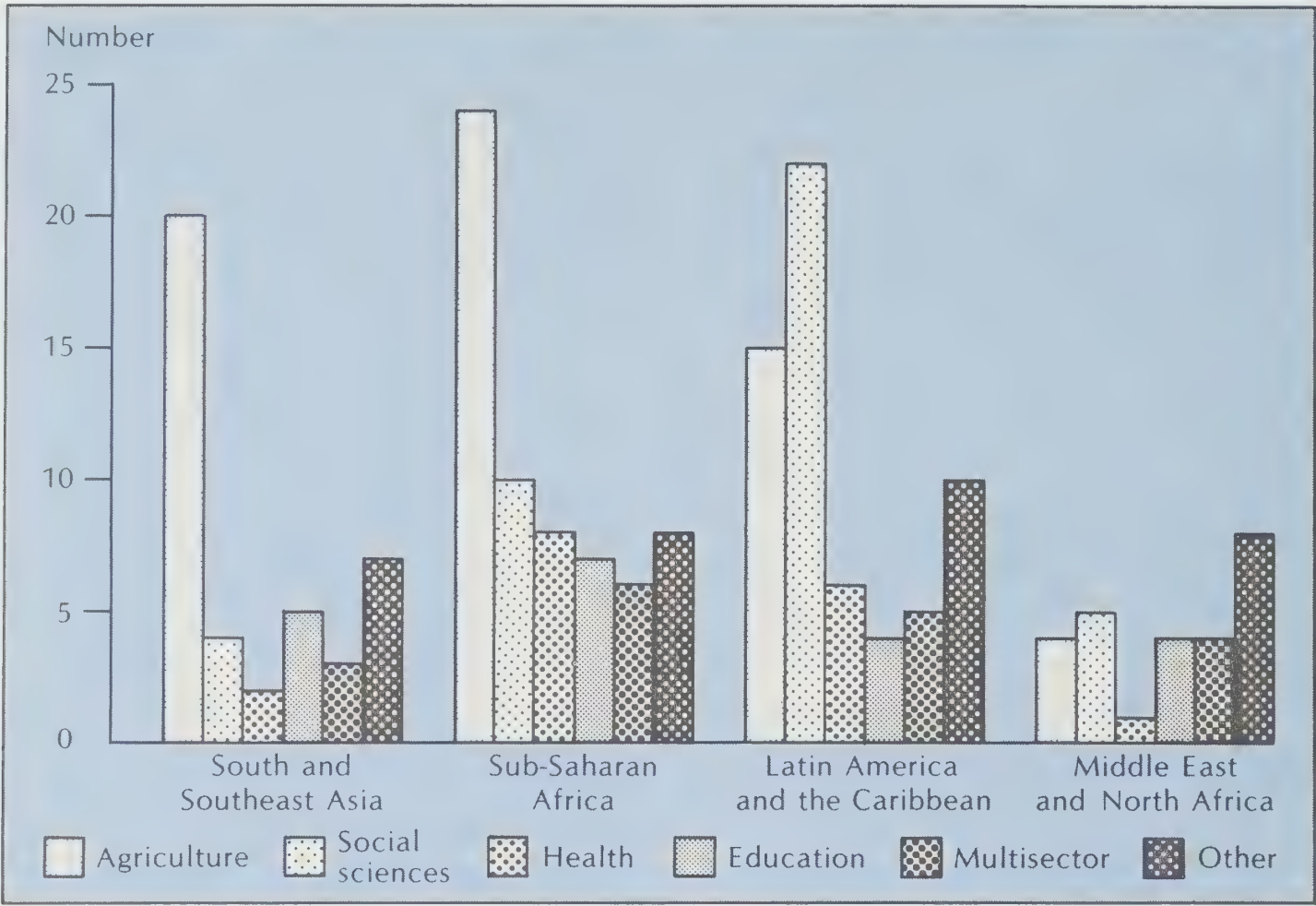


Fig. 2. Multilateral research-related institutions by sector and region.

are located in Latin America; the number appears to be related to the combination of a large pool of well-trained researchers in an environment where some governments have been neither receptive to nor supportive of social science research in national institutions. Multilateral institutions have been perceived as providing easier access to external funding and greater insulation from political pressures.

Although the data on the resources of these institutions are still the least precise area of information collected in the survey, it seems that they employ over 5000 professional staff (the term professional was used for personnel having at least a Bachelor's degree or its equivalent).

**Role of Multilateral R&D Institutions**

The development of the multilateral research and development (R&D)

institutions represents an enormous investment of resources and a considerable pool of expertise. The magnitude of the figures involved, and also the tremendous potential they represent, make it important to consider the effectiveness and the opportunity cost of the resources used. This can only be done on an institution-by-institution basis — considerably beyond the scope of this limited survey. It may, however, be useful to outline some features that provide a broad framework for future institutional assessment. This section examines briefly the reasons for the creation of these institutions and the role they play before raising a number of issues related to their continued development and effectiveness.

In addition to the clear applicability of a multilateral approach to research activities, there have been, of course, precise considerations lying behind the increased resources to multilateral, research-related institutions:

Information flow — During the colonial period, research in colonial territories was usually managed directly by, or supervised from, the metropolitan capital. A certain distribution of information throughout the colonial territories was assured using the capital as the focal point. Independence meant that there was a need to replace and widen these channels, so that exchange of information was no longer restricted to one colonial sphere of influence. Multilateral centres provide new channels of information flow that are not dominated by one country.

Colonial legacy on research agenda — The colonial era also set a research agenda that took excessive account of the colonial power’s interests. Consequently, there was a need to move quickly to focus research on areas of interest to the developing countries. There was also the feeling that where the metropolitan countries had supported scientific work of interest to the colonial areas, the resources devoted to these

fields might diminish after independence (e.g., tropical health).

Weak infrastructure in developing countries — With inadequate infrastructure and capacity in developing countries, multilateral institutions could perform important services to national R&D through undertaking research and assisting in building research capacity.

World-class research — There was also the idea of bringing world-class research to bear on intractable development problems. By providing excellent facilities, and attracting scientists of world standing, it was felt that multilateral institutions could contribute to making a real breakthrough on some major development problems.

Proven productivity — The positive image of the utility of multilateral research was further reinforced by some highly successful research, particularly in the agricultural field, undertaken by international centres.

Multilateral research-related institutions by sector and by region of the world, 1983.

	South and Southeast Asia	Sub- Saharan Africa	Latin America and the Caribbean	Middle East and North Africa	Sector total	Percentage of total
Agriculture	20	24	15	4	63	33
Social sciences	4	10	22	5	41	21
Education	5	7	4	4	20	10
Multisector	3	6	5	4	18	9
Health	2	8	6	1	17	9
Industry	3	2	3	2	10	5
Management and administration	3	1	1	2	7	4
Environment and ecology	—	2	2	—	4	2
Information and communi- cations	1	1	1	1	4	2
Engineering and technology	—	—	—	3	3	2
Physical sciences	—	1	2	—	3	2
Energy	—	1	1	—	2	1
Total	41	63	62	26	192	100



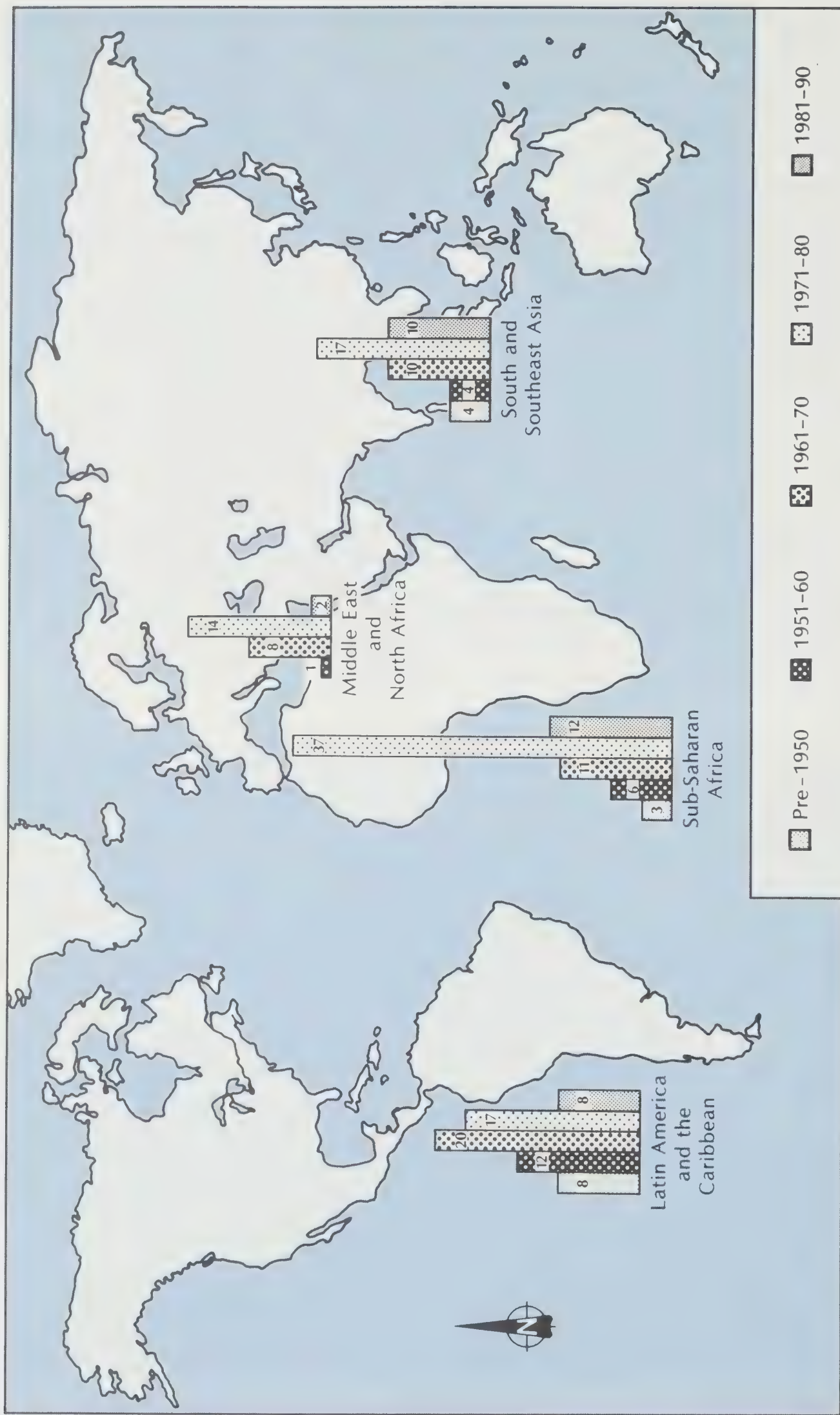


Fig. 3. Multilateral research-related institutions by region and date of establishment. (The projection for 1981-90 is based on 1981-85 experience.)

The sections that follow concentrate on those institutions classified as “research institutions,” although some of the analysis may be extended to the “research-complementing” ones as well. The main functions of the multilateral research institutions have been to undertake research for development and to provide support to national systems; given that the set of institutions identified accounts for a significant quantity of resources, there are a number of issues that warrant consideration. There is a brief discussion of the following:

- (a) Payoff (productivity and effectiveness) from the institutions,
- (b) The need for a concerted view of the priorities for funding,
- (c) The relations of these institutions to national research, and
- (d) Cost-effective alternatives to the creation of new research institutions for ensuring the multilateral dimension in research.

The *first* major issue is that relating to the payoff (productivity and effectiveness) from the considerable resources invested. By their very nature, the multilateral institutions have often been drawn into a higher cost pattern (higher salaries, better facilities) than prevails in developing-country national research, and the expectation has always been that their product would compensate for the higher costs. Most are still recent creations, and they have not yet had adequate time to provide good-quality research that can feed into countries’ development; a recent U.S. Agency for International Development (USAID) publication (*Plan for Supporting Agricultural Research and Faculties of Agriculture in Africa*, May 1985) recalls that “although the beginning of a formal public-supported agricultural research process dates [in USA] to 1861, results in terms of increased yields did not begin to appear until the 1930s . . . .” The mid-1980s are seeing increasing attention paid to the

“effectiveness” of aid generally in the development process as shown by the Cassen Report on Aid Effectiveness commissioned by the IMF/International Bank for Reconstruction and Development (IBRD) Task Force on Concessional Flows and by the existence of the Task Force itself. As might be expected, similar concerns have been voiced with respect to the research institutions, although these have been directed for the time being at the IARCs because they are the best known, the most easily identifiable, and account for a substantial proportion of total funds to multilateral research.

The CGIAR recently completed a major study on the “Achievements and Potential of the International Agricultural Research Centres” that represents one of the largest reviews ever undertaken of the performance of a set of research centres. The contribution, high payoff, and impact on increasing food production of some of the IARCs work particularly on rice, maize, and wheat are well documented. The CGIAR study also devotes considerable attention to the role of the IARCs in building research capacity in developing countries.

In addition to agriculture, there are signs of significant developments in other fields — the International Centre for Diarrhoeal Disease Research — Bangladesh (ICDDR), for example, contributed to the major development of oral rehydration therapy and is now working on the field trials of a new oral vaccine for cholera. Equally, not all work undertaken by multilateral institutions relating to research provides for such tangible products as vaccines and high-yielding crop varieties. Although the available evidence is not comprehensive enough to show that significant benefits are being derived from all institutions, and undoubtedly many could improve their present effectiveness, the limited evidence does indicate that they can perform a valuable



supplementary and complementary role to national programs.

A *second* issue concerns the need to establish a broader framework in which to examine relative research priorities and requirements before expanding existing or establishing new centres. Although any one individual institution may be addressing a significant development issue and may provide a significant return on investment over time, there are opportunity costs in terms of other research issues and national program needs that could also benefit from more resources.

Most existing institutions receive much of their funding from ODA resources that have shown limited real increases in the last decade. Although developing countries provide some support, particularly to regional centres, and this may increase in the future, it appears that most of the funding for these centres will continue to come from ODA sources. Thus, expansion of existing centres and proposals to create new institutions, both to fill major gaps and to respond to new challenges such as in energy or biotechnology research, must increasingly take account of total resource limitations. To date, there appear to have been few attempts to establish new institutions in terms of any relative priority between sectors; even within one sector, information and mechanisms by which to make such assessments are weak.

The CGIAR provides a notable exception where a more concerted approach within one sector has been used in funding the work of 13 IARCs on the world's major food commodities. A mechanism exists for allocation decisions to be made explicitly on the priority accorded to different commodities and different areas of research.

A *third* issue concerns the relationship of these institutions with national research in the developing country. Whatever the potential of the research and support they provide, its

actual use in national development or decision-making can only be as effective as the national research system with which the institutions interact. There is, therefore, a balance required between support to these institutions and support for building research capacity and facilities at the national level. They are sometimes considered as competitors to national systems for donor support. One study has even described them as the "main stations" of Third World research, with national research as the "branches," whereas clearly multilateral research centres must support and strengthen national programs. Another study some years ago indicated that the growth of multilateral research has been financed largely by an increase in funding for research, although there appeared to have been some modest reduction in funding for national programs.

Equally, there are cases where funding to multilaterals has actually brought forth increased complementary funding to nationals. The competitive element should not be exaggerated. IDRC is currently supporting a study to estimate the overall funding provided by major donors to support development research. This should permit a more informed judgment on the proportion of overall funds available to support development research that is going to multilateral institutions.

A second element of the relationship is consideration of the actual services provided to national research. In the past, the creation of new multilateral institutions may not always have given adequate consideration to what research and research services would best enhance national efforts. Some initiatives may have been dictated by "supply" considerations, i.e., the identification of an important research subject that would benefit from the concentration of resources implied by creating a regional or international institution. In such cases, consideration of the most appropriate

focus in light of national systems' needs has only come after the new institution is established.

With an increasing awareness of the importance and growth of national research programs, multilateral institutions must strive to maximize their support to national research systems. With the increasing heterogeneity of national systems' capabilities and requirements, however, these centres are facing an even greater range of demands on their services — this can be illustrated by the CGIAR review's suggestion that the IARCs may have to move into more basic research to support sophisticated national systems (e.g., in Brazil and India), while providing all the traditional supports to other countries. Clearly, many of the smaller countries (80% of those in sub-Saharan Africa and in the Latin American and Caribbean region have populations of less than 10 million) are unlikely to be able to afford a set of national research institutions that will span in depth all the problem areas in which they require research. Some recognition of interdependence and of the benefits through pooling research resources to achieve critical mass is clearly desirable for those countries in particular.

A *fourth* issue links to the preceding one: given their importance to national research, how can multilateral consultation and backstopping be provided most cost effectively? The creation of new regional and international institutions, particularly research centres, has been costly. In consequence, there has been an increasing tendency to emphasize models of international and regional cooperation that allow for adequate coordination without creating major facilities requiring substantial, long-term international funding. These approaches reduce the large capital and operating costs of research centres by concentrating on *networking* and pooling the use of existing *national*

resources and facilities. Some recent examples that contain elements of this approach are: the International Council for Research in Agroforestry (ICRAF), the International Board for Soil Research and Management (IBSRAM), the International Irrigation Management Institute (IIMI), the International Network for the Improvement of Banana and Plantain (INIBAP), and the regional concerted research program being undertaken by the countries of the SADCC, where each member country takes leadership responsibility in one area. The Southern Africa Centre for Cooperation in Agricultural Research (SACCAR), for example, is located within the Ministry of Agriculture in Botswana.

## IDRC and Multilateral Research

IDRC has actively encouraged and participated in the creation of several international and regional research institutions; indeed, few donor agencies have been more active in this area. The Centre played a role in the activities leading to the establishment of three out of the five organizations mentioned in the preceding paragraph. The Centre has made an effort to ensure that proposed new centres are carefully justified and merit support before it becomes involved in supporting their establishment. Where support has been provided for ongoing programs, it has been directed at increasing the links between these centres and national systems. Support for multilateral institutions has to be justified on the basis of complementing and reinforcing national research programs.

Despite this active support, the Centre has directed an increasing proportion of its resources over the years at national programs in developing countries. The sections that follow document some of the Centre's activities in support of both national and multilateral institutions.



# WHAT IS IDRC?

The International Development Research Centre (IDRC) is a corporation created by the Parliament of Canada in 1970 to stimulate and support scientific and technical research by developing countries for their own benefit.

The fields of investigation to which IDRC gives its financial and professional support include: farming; food storage, processing, and distribution; forestry; fisheries; animal sciences; energy; tropical diseases; water supplies; maternal and child health; education; population studies; economics; communications; urban policies; science and technology policy; and information systems.

Although IDRC is funded entirely by the Canadian Parliament, to which it reports annually, its operations are guided by an international 21-member Board of Governors. Under the IDRC Act, the chairman, the vice-chairman, and nine other governors must be Canadian citizens; in practice, 6 of the remaining 10 governors are from developing countries.

The Centre's programs help developing countries to build the scientific competence of their institutions and their researchers so that these countries can work to solve their own problems. Opportunities are given to researchers to broaden their experience through further specialized study or on-the-job training.

IDRC emphasizes the role of the scientist in international development and encourages Third World countries to draw on the talent of their own scientific communities. Building a strong local base for future research is an important objective of most IDRC-supported work. Research projects are identified, designed, conducted, and managed by developing-country researchers in their

own countries, to meet their own priorities.

IDRC helps to create and supports international research networks through which developing countries can learn from each other, share common experiences, and conduct similarly designed studies in areas of mutual concern. It also promotes cooperation between developing-country researchers and their counterparts in Canada.

## Research Programs

**Agriculture, Food and Nutrition Sciences** — In this group of related sciences, emphasis is on farming systems, social forestry in arid and semi-arid lands, and aquaculture. Specific areas of support include: previously neglected food sources such as root crops, food legumes, and oilseeds; agroforestry (growing trees and crops together); multiple cropping systems; improvement of pasture lands; use of nonconventional feeds for animals; fish and shellfish farming; postproduction systems for the preservation, processing, and distribution of food crops, fruit, and fish; and the economics of small-scale farm production and marketing.

**Health Sciences** — The division's support is concentrated in five broad areas of applied research: water supply and sanitation; maternal and child health; tropical and infectious diseases; occupational and environmental health; and health services research.

**Social Sciences** — Research supported by the division is designed to improve understanding of the social and economic issues related to international development, permitting researchers and policymakers to formulate policy options in several thematic areas. These include: education, population, science



*Drought forces nomadic peoples to change their lifestyles.*

and technology, energy, urban development, economics, and rural development. Support is also given to a limited number of national and regional institutions in the social sciences and to research on problems of special regional concern.

**Energy** — The worldwide effects of unstable energy supplies and prices in recent years have underlined the urgent need for increased research on the energy problems of those most adversely affected — the developing countries. One of IDRC's major activities in this area has been the coordination of an international Energy Research Group comprised of 10 energy analysts and policymakers from developing countries. Funded jointly by IDRC and the United Nations University in Tokyo, the Group has been working to identify energy research priorities for developing countries and to suggest how national,

regional, and international research resources can be better allocated.

## Information Programs

**Information Sciences** — Support given by the division helps developing countries to: establish regional and national information systems and improve library infrastructures at these levels; participate in international information networks; create specialized information centres (serving the region or world) on development-related subjects; strengthen sectoral information programs, especially in agriculture, health, population, industry, the environment, cartography, and social issues; and develop information tools and methods. The division's computer systems group provides internal services and distributes MINISIS, a bibliographic software package designed by IDRC, to developing countries. In addition, a library



and micrographics unit serve IDRC staff, the Canadian development community, and IDRC-supported projects.

**Communications** — Services provided by the division include: the publication and dissemination of the results of IDRC-supported research via print and film media, public affairs, and translation. The division also supports projects aimed at strengthening the ability of research institutions and communications media in developing countries to prepare and disseminate scientific and technological information.

## Collaborative Programs

**Cooperative Programs** — The division promotes collaboration between scientific research groups in developing countries and their counterparts in Canada — whether academic, governmental, or private. By establishing channels of communication among scientists, the division helps improve the transfer of research results from Canada to the Third World. However, project support is open to all disciplines that contribute to Third World economic or social development and in which there is recognized Canadian expertise. It is important that the developing-country research group play a significant role in formulating a scientifically sound project proposal and in planning and executing the project, thereby strengthening its research capacity.

**Fellowships and Awards** — The division funds the training of junior and senior Third World scientists, managers, and planners working in sectors covered by IDRC's program divisions. Preference is given to individuals from the least developed countries and the emphasis is on professional upgrading rather than basic training. In addition, the division supports practical, nondegree group training to improve technical, research, and administrative skills of

individuals. A portion of the division's funds is also used to encourage the involvement of young Canadian researchers in scientific areas of concern to IDRC and to expose them to the problems of the developing world. These doctoral students are posted to a Third World country for studies, research, or placement.

## Funding and Selection of Projects

Each program division channels funds to institutions in developing countries (government departments, universities, research centres, etc.), to international and regional institutions, and to Canadian institutions. The recipient is expected to pay a portion of the costs.

All projects are reviewed by IDRC's professional staff and assessed in light of factors such as:

- **Development priority:** Is the proposal consistent with national or regional development goals?
- **Regional applicability:** Are the research findings likely to be applicable in developing countries or regions other than the one in which the research takes place?
- **Usefulness:** Will the research help close gaps in living standards or lessen the imbalance in development between rural and urban areas?
- **Local resources:** Will the project make full use of local resources and research workers from the region?
- **Training:** Will the project result in better trained and more experienced researchers and more effective research institutions?
- **Research area:** Does the research fall within IDRC's areas of concentration?

When IDRC agrees to support a project, it enters into an agreement with the developing-country institution. In it are stipulated the project's purpose, research methods, payments, and a

schedule for the research and progress reports.

### The Program Officer

Although IDRC itself rarely undertakes research, its program officers are highly qualified professionals. One of their main functions is to respond to project ideas proposed by developing-country researchers and to evaluate the suitability of proposals in light of the criteria stated above.

Once a project has been approved in principle, the program officers collaborate with the institution submitting the proposal in further refining the project idea, provide administrative and technical advice, and help in preparing a project budget. Program officers are based either at IDRC headquarters in Ottawa or in one of the regional offices. In the regions, they help determine research priorities and prepare detailed annual plans of projects to be defined and developed, workshops and seminars to be organized,

and maintain contact with research institutions throughout the region.

### Project Approval

Before funds are appropriated, a project proposal must go through a formal approval process.

Authority to approve projects for which funding exceeds \$100 000 lies with IDRC's Board of Governors. It delegates approval authority to the President and the Vice-Presidents for projects up to \$100 000, to Directors of individual divisions for projects up to \$50 000, and to Deputy Directors for projects up to \$15 000.

When a project has been approved, funds are appropriated by the Office of the Comptroller General and Treasurer. The Secretary's Office prepares a Memorandum of Grant Conditions (MGC) governing all aspects of the relationship between the signing parties. Once the MGC has been signed by the recipient, funds can be forwarded.



## The Needs of Farmers

IDRC was created to serve the needs of the poor of the developing countries, particularly the rural poor. Its immediate clients and beneficiaries, however, are those countries' scientists. The Centre's program staff are constantly seeking better ways to support them, both financially and intellectually.

One significant expression of the great importance placed by the Centre on the many contributions made by Third World scientists toward solving the problems of the developing countries was the "Symposium on Drought in Africa," organized by IDRC in Ottawa in August 1985.

The objective of this meeting was to provide a forum for 20 African scientists. Over a period of 3 days, these researchers made headlines in Canada's news media as they explained, from their point of view, the crisis that has gripped their continent. And, above all, they stressed that they themselves are prepared to work for solutions, in particular by channeling the results of agricultural research to the millions of peasant farmers. Indeed, unless Africa develops its own experts, how can it possibly hope to utilize modern technology, not just for its survival but for its development? The symposium in Ottawa once again clearly demonstrated the essential role that scientists have to play in each country's national development.

### Ultimate Judges of Research

In the past 15 years, the Agriculture, Food and Nutrition Sciences Division has evolved a number of mechanisms for linking itself with those scientists closest to the users of agricultural research. These include: posting program staff to the Centre's six

regional offices, creating informal networks of researchers, and supporting on-farm research with the farmers as active partners. These mechanisms serve to illustrate the theme of this 1985 edition of IDRC's annual review of its activities.

Among the four main kinds of actors on the international research scene — funding agencies and international, regional, and national research centres — the Division has listened first to the national institutions. It made this choice because scientists in national programs are the ones closest to the farmers who, by rejecting or accepting new cropping systems, for example, continue to be the ultimate judges of the results of agricultural research. When the results are practical, productive, and profitable, the farmers do adopt them with surprising alacrity.

Scientists in the least-privileged countries are the ones in greatest need of aid because they are isolated, underequipped, and underpaid. To them, simply knowing there is an organization with considerable resources at its disposal, which is ready to listen to them, is a great source of hope. Throughout 1985, the Agriculture, Food and Nutrition Sciences Division made a significant effort to respond to that hope.

### The Poor Man's Steak

In Asia, the Division continued its support for a number of research projects on protein-rich foods such as the pulses, mainly beans and peas. These contain up to 30% protein and are an important part of the diet of the poor. Beans and peas also draw their nitrogen from the air, which diminishes the need for expensive fertilizers. Despite these qualities, it is only relatively recently that pulses have become a subject of research in developing countries. Consequently, these



crops had been pushed out into marginal land, and peasants had preferred to put their best efforts into high-yield rice and other grains of the “green revolution.”

In Bangladesh, the average daily availability of leguminous proteins is no more than half the recommended adult requirement of 15 g because it is so much more profitable to produce wheat or rice. As a result, the Bangladesh Agricultural Research Institute decided to improve several varieties of pulses. It has already achieved a number of useful results, particularly with khesari, a pulse that resembles sweet peas but which also contains neurotoxic substances. Khesari (*Lathyrus sativus*) is an important element in the diet of the poorest people and an especially hardy food crop. This explains the current interest in those strains discovered by the Institute to contain low amounts of harmful substances.

Specialists of the Nepali Department of Agriculture are also trying to reverse the trend away from food legume crops by giving priority to improving the yield of chickpeas, lentils, and soybeans. Thanks to IDRC funding, they will have easier access to the most recent strains bred by the major IARCs.

In the case of Pakistan, disease has been the main reason for the considerable decline in the yields of pulses. Support given to the Pakistan Agricultural Research Council will help identify varieties of mung bean (from which bean sprouts are grown) and chickpeas that are resistant to cercospora and ascochyta blight.

Thailand, an exporter of rice and cassava, depends on yet another pulse, peanuts, as an alternative to cassava for farmers in the northeast of the country. The cassava, which was traditionally exported to Europe, no longer has a market there. IDRC’s contribution will enable the faculties of agriculture at Khon Kaen and Kasetsart universities to experiment in breeding varieties of peanuts

adapted to conditions in the northeast region.

Sometimes, results surpass all expectations, as was the case with cowpea research funded in Burkina Faso (formerly Upper Volta) over the last 8 years. The head of the research team achieved a major breakthrough by breeding a variety of cowpea that is resistant to the parasitic weed, striga. He is now breeding this characteristic into other strains of cowpea that, in turn, have the advantage of being less attractive to bruchids, small insects that can turn the entire contents of a silo into empty husks. This project is administered by the International Institute of Tropical Agriculture (IITA) in Nigeria which is now



*This West African researcher describes the advantages of his new cowpea varieties.*



disseminating the cowpea strains bred in Burkina Faso to numerous other countries.

The results obtained are of great significance because cowpeas are highly resistant to drought. In the sub-Saharan countries, they are the prime food of the rural poor and are also eaten as fritters on the streets of the large cities. In general, with research making little progress to increase the drought resistance of many plants, any improvement to a plant that is already drought resistant, such as cowpeas, is extremely important for Africans.

### **The African Dehuller**

Two cereals, millet and sorghum, are also drought resistant. There had been a tendency to replace them with imported cereals, but they are now regaining their former prominence. Processing them, however, is extremely difficult. It takes an hour of hard physical labour to dehull each kilogram of millet or sorghum, and women are increasingly reluctant to undertake such a trying task.

To bring these cereals back into favour with consumers, the Agriculture, Food and Nutrition Sciences Division began funding the development of a simple, sturdy dehuller for millet and sorghum some 10 years ago. Thanks in part to the Division's efforts, there are now 21 small mills in Botswana using 36 of these dehullers. The new millers have even set up their own Botswana Mill Owners' Association. IDRC will fund a study to summarize their experience to enable Botswana's Rural Industries Innovation Centre, which has manufactured most of the dehullers, to improve both the performance and the safety of the machines.

Another grant, to a nongovernmental organization (NGO) in Gambia, Catholic Relief Services, will provide it with an opportunity to learn how to build a smaller version of this machine. Another project will enable the National

Research Council in Kampala to introduce this technology into Uganda.

In the Middle East, the Division will support an ambitious research project at the International Center for Agricultural Research in the Dry Areas (ICARDA) in Aleppo, Syria. The purpose is to improve and test two promising prototypes of lentil harvesters. When lentils ripen, the pods of this very important dry legume fall to the ground. Farmers have to harvest them all in a few days, and labour is a major obstacle to production. The workers' wages are now so high that it is cheaper to consume imported produce. A harvester appropriate to the needs of the countries in the region would make it possible to resume lentil production, which would ultimately provide jobs that are now being lost to those countries from which the food is imported.

### **Before and After the Rice Crop**

The high-yield rice varieties now being planted by peasants all over Asia produce larger crops in less time — usually 100 days rather than the 160 needed by traditional varieties. The rice paddies are thus freed up for other crops: cereals (wheat, corn, sorghum) and pulses (beans, peas, cowpeas, soybeans, peanuts).

Beginning in the mid-1960s, researchers undertook a search for new cropping systems whereby other crops could be planted before and after the rice so that the paddies and fields could continue producing throughout the year. At the International Rice Research Institute (IRRI) in the Philippines numerous sequences have been tested: rice/corn, rice/wheat, rice/pulses, rice/soybeans/wheat, etc. But even after experimenting on test plots with numerous rice-based systems, certain questions, which are at the heart of the controversy about the "green revolution," remained unanswered. Can peasant plots support such sequences? Do peasants have the means and the knowledge to use these





*Specialists from about 15 Asian countries regularly visit the International Rice Research Institute in the Philippines for advanced training.*

more complicated cropping systems? Are the new methods and varieties being proposed by researchers really appropriate as replacements for the traditional cropping systems? There was only one way to answer these questions: test the new systems on farmers' plots, with the help of farmers.

Scientists need a particular measure of courage if they are to carry out their experiments in full view of those they mean to help. In many areas of the world, researchers are often clustered together in the artificial environments of research stations where they produce beautiful reports but little else. Those Asian scientists who decided to roll up their shirt sleeves and venture out into "real" farmland found a supportive partner in IDRC.

Since 1975, the Agriculture, Food and Nutrition Sciences Division has expanded its support of such on-farm research methodology. In 1985, the Division renewed its support for what

has become the Asian farming systems network. About 50 sequences of crop species are currently being tried out in 15 Asian countries, including China.

By continuing to support the Asian farming systems network, IDRC hopes to ensure the development of genuine research capabilities at the national level. There has been concern that research might become too centralized, with scientists in national agricultural research centres being limited to passively applying ready-made answers imported from international research centres. The new funds granted to IRRI for the network program are intended to avoid this by helping national researchers become full-scale partners of international specialists.

### **Bananas are Vegetables Too**

For breakfast, sliced bananas fried in oil; for lunch and dinner, boiled bananas along with the main dish. In the tropics that is how people eat plantains, close cousins of those sweet



bananas that are exported in bulk to the temperate countries. The big leaves of banana trees and plantains also provide shade for almost every peasant home in the rural areas of the humid tropics. Out of every 10 bananas consumed in the world, only one is an export product. Research, however, has only just begun to focus on those bananas, and particularly plantains, eaten at home.

Recently, the disease cercosporiasis (black sigatoka), has been decimating the trees of banana growers who cannot afford expensive pesticides. The Agriculture, Food and Nutrition Sciences Division, which funded research into plantains in Cameroon about 10 years ago, is now supporting other research in Honduras and Costa Rica. In the last few years, the Fundación Hondureña de Investigación Agrícola, in La Lima, has been able to identify several strains of plantain that resist black sigatoka. A genuine breakthrough seems possible and the support of IDRC

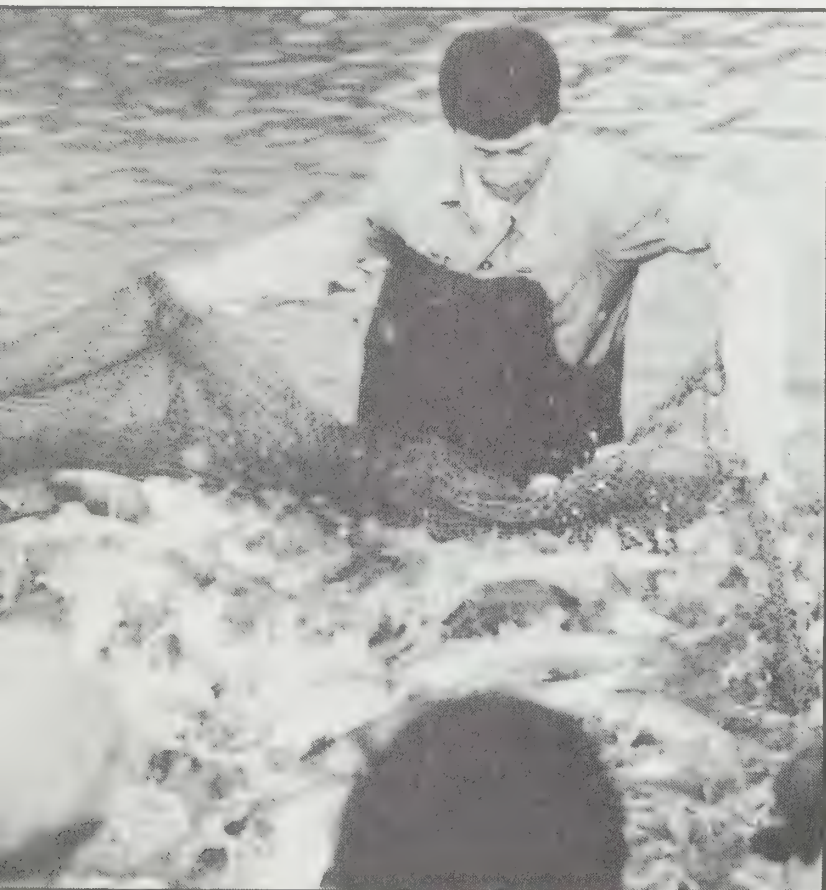
will help this very promising research to continue.

The funding granted to the Tropical Agricultural Research and Training Centre (CATIE) in Costa Rica will be used to test multiple cropping systems that link plantains and root crops. The work at the Centre, which is regional in scope, will be done in collaboration with the staff of the Panamanian and Nicaraguan national programs. Specialists from the University of the West Indies in Trinidad and Tobago and from the branch office of the Institut national de la recherche agronomique (France), in Guadeloupe, will also contribute.

All these projects will be coordinated by a new international organization that the Agriculture, Food and Nutrition Sciences Division helped establish after several funding organizations asked IDRC to create and guide the early endeavours of the International Network for the Improvement of Banana and Plantain (INIBAP).

This network will be a modern variation of the IARCs established in the 1960s and 1970s. Instead of taking the form of a large complex of laboratories and test plots grouped together in one place, the new structure will essentially consist of four regional networks coordinated by a director and a very small administrative team. A decentralized structure of this kind is essential for plantains, which are grown in a wide range of environments. The success of this new experiment in the mobilization of such decentralized agricultural expertise will depend very much on the drive and energy displayed by the national research groups.

The director of INIBAP will be based in the office of CIRAD (Centre de coopération internationale en recherches agronomiques pour le développement), in Montpellier, France. IDRC has undertaken to provide part of the cost of the organization's first 4 years of operation. This will involve



*Chinese fish farmers are masters in the art of raising carp.*

far less expenditure than for a large international research centre.

### Exporting Chinese Wisdom

Over the centuries, Chinese fish breeders have perfected inexpensive methods for enriching the water in which their fish grow. About 200 kg of silkworm excrement, for example, helps produce 25 kg of fish, or 15–45 pigs can fertilize 1 ha of hatchery ponds. Silver and bighead carp can also feed on aquatic plants fertilized by the droppings of grass carp, or directly on the droppings themselves.

In the lower courses of the Changjiang and Zhujiang rivers, the best fish farmers in China produce up to 15 t of fish per hectare, using the droppings from their domestic animals. The average output in China, however, is only 1 t/ha, and many fish farms produce less than 700 kg/ha.

This wide variation results from the fact that certain local conditions are not taken into account when these methods are exported to provinces of China where the agroclimatic conditions differ. If these methods are to be adapted, however, there has to first be scientific understanding of the behaviour of fish in an environment saturated with animal manure and organic waste.

The Agriculture, Food and Nutrition Sciences Division will fund the work of the Asian–Pacific Regional Research and Training Centre for Integrated Fish Farming, a regional centre established at Wuxi, north of Shanghai, with assistance from regional organizations. Because the Division has been increasingly stressing the importance of training researchers, IDRC's Fellowships and Awards Division has undertaken to offer 10 scholarships a year for 2 years to researchers from other Asian countries so that they can train at Wuxi. Eventually, another network of projects associated with this Chinese centre should take shape with support from IDRC.

In the shorter run, researchers at the Freshwater Fisheries Research Station at Comilla, Bangladesh, will form one of the first links in this network. The Agriculture, Food and Nutrition Sciences Division has decided to support their work on the Hilsa, a fish that, in a country rich in river meanders and ponds, is the main source of protein. There is intensive artisanal fishing for Hilsa, but practically nothing is known of its biology, its breeding grounds, or its migrations. If Bangladeshi scientists learn more about its behaviour, they will be able to devise policies for scientific management of the stock. There are also plans to investigate the possibility of domesticating Hilsa and cultivating them on fish farms.

Before they can start the breeding process, however, fish farmers will have to clean up the water. Asian countries currently import tea-seed cake at great expense to get rid of undesirable species before seeding the ponds. There are dozens of local plants, however, that kill fish and have been identified in India, Nepal, and Thailand. The Division will use funds from IDRC's Cooperative Programs to enable Third World and Canadian specialists to collaborate on research to analyze the characteristics of these plants. The work will be conducted at Prince of Songkla University in Thailand, in cooperation with chemists at the University of British Columbia in Vancouver.

### Sea Urchins and Shellfish

Until recently the Agriculture, Food and Nutrition Sciences Division had not been much involved in funding work on sea urchins and shellfish — with the sole exception of oysters, which are already a part of the diet of people living on the banks of the vast tropical mangrove swamps. Now, however, if it is clear that small-scale fishermen or fish farmers will benefit, the Division will be keen to support national research on these extremely profitable species.



The Division has thus responded favourably to a request by researchers at the Universidad Austral de Chile, at Valdivia, who are seeking to improve the storage, processing, and transport of oysters and mussels from Chiloé, a very poor island in the south of the country. The Pontificia Universidad Católica de Chile will also be supported in its efforts to produce a model for the management of ocean products that should eventually improve the lot of 80 000 families along the Chilean coast.

In Jamaica, where oyster research supported by the Division has had excellent results, the new oyster-farming industry is struggling to overcome a lack of seed oysters, as very young oysters are called. A well-adapted system of breeding them, developed in previous projects, has been adopted by the coastal population who get their supplies of seed oysters from one location, Bowden Bay. Oyster larvae cling to and grow well on pieces of old tires arranged in submerged baskets. After 2 months, the strings of tire pieces, covered with young oysters, are gathered and suspended from rafts floating in numerous other bays of the island nation. After another 2 months, the oysters are ready for sale at a price of \$1/kg. This is an extremely profitable and rapid operation compared with oyster farming in the temperate countries.

Bowden Bay, however, can no longer meet the demand and is also threatened with the disturbance of its waters because of the establishment of a new banana port. The Agriculture, Food and Nutrition Sciences Division has thus undertaken to fund cooperative research into other methods of seed oyster production, which were devised at the University of the West Indies in Kingston in collaboration with specialists at Dalhousie University in Halifax, Canada.

In another project, Canadian researchers from the University of British Columbia will help their counterparts at the National Environmental Protection

Council in the Philippines where the coastline near many towns is severely threatened. Three major marine ecosystems — coral reefs, mangrove swamps, and seagrasses — are disappearing rapidly. The purpose of the research is to restore the seagrasses, thereby protecting the coast from erosion and restoring the habitat of numerous marine species.

In the Middle East, on the Red Sea coast, the Division will also continue to support a group of Sudanese researchers who are working in extremely difficult conditions to revive the cultivation of pearl oysters (renowned for mother of pearl). These have greatly diminished since the 1960s because of diseases that remain a mystery.

### **Farmyard Animals**

When larger animals are decimated by diseases such as trypanosomiasis (which in humans is called sleeping sickness), part of the loss in animal protein in the local human diet can be made up from small rodents, which can be protected from infection by being kept in separate cages. The Agriculture, Food and Nutrition Sciences Division has, consequently, begun to fund research into the breeding of rabbits in East Africa and guinea pigs in South America where they are already part of the diet of the populations of Andean countries.

In the Morogoro region of Tanzania, people consume very few dairy products and little beef because of the ravages caused by trypanosomiasis, which is transmitted to animals by the tsetse fly. Researchers at the Sokoine University of Agriculture are convinced that breeding rabbits as an alternative is the solution. For about 10 years they have been examining a variety of ways to feed the rodents. Their work is well known and more and more Tanzanians are coming to them to ask for breeder rabbits. Many rural families breed three or four rabbits at a time in their yards, feeding them on kitchen scraps and wild



lettuce. The support of the Division will enable the Tanzanian team, in close collaboration with small-scale farmers, to test its models for the farmyard breeding of rabbits. Once the new breeding systems have been tested, they will be disseminated through the schools. It gives the Division the greatest satisfaction to support African researchers who are keen to work side by side with the potential users of their research.

In El Salvador, one of the Central American countries most affected by armed struggle between government troops and guerrillas, it takes considerable courage for a researcher to visit the rural areas and interview farmers. Until now, native breeds of swine in the interior of the country have never been studied systematically.

Specialists from the Salvadorian Ministry of Agriculture and Animal Husbandry, with the support of the

Institute of Nutrition of Central America and Panama (INCAP), in Costa Rica, have begun the study of "negro," "parchado," and "chino" swine. They will also have the backing of specialists at McGill University in Montreal, thanks to an IDRC cooperative project. The researchers will allow themselves 3 years to provide breeders with better methods for fattening their swine. The project will also produce information bulletins for extension workers and farmers.

### **Recycling Farm By-Products**

IDRC has supported the establishment of an African agricultural by-products research network. The common element is the attempt to make use of crop residues and agricultural by-products in feedstuffs. This network, which is coordinated by the International Livestock Centre for Africa (ILCA) in Addis Ababa, Ethiopia, now



*Most East African farmyards sport a rooster and a flock of chickens. Soon, the fowl will be joined by rabbits, another excellent source of protein.*



includes six national projects funded by IDRC and several teams from other countries that are members of the network.

The Agricultural Research Institute of Nicosia, Cyprus, has just joined the network, with the aid of a grant from IDRC. Researchers from this Mediterranean island will study the feeding of dairy cattle on barley straw enriched with urea. In other tests, cattle will be fed on citrus pulp or grape marc (the residue after the juice has been extracted) mixed with poultry manure. The results from Cyprus, which are almost complete, will be of great interest to breeders in North Africa and the Middle East. The work should benefit all the members of the network.

In Latin America, another series of projects on animal-production systems is developing into a major network. The 10 national projects involved are linked to two international centres, CATIE in Costa Rica and the International Centre for Tropical Agriculture (CIAT) in Colombia.

By devising an on-farm methodology for animal sciences research, the scientists participating in the network are trying to do for animal husbandry what their Asian colleagues have managed to do for crops.

An important project of the Latin American animal production systems network, in Costa Rica, involves agroforestry. In the largely undeveloped regions of the country's Atlantic coast, where 70% of the forest is still virgin, the environment is undergoing total transformation. New settlers cut down the trees and then raise livestock on rapidly deteriorating land. The CATIE researchers will try to bring agriculture and livestock raising into harmony with the environment by reintroducing trees to farms. For the first time, CATIE scientists from a variety of disciplines will work together. If this ambitious project succeeds, it could provide an ecologically sound model for tropical farming, with long-term viability.

A number of Third World governments have already begun reforesting their countries' deteriorating regions and some are tackling areas in the process of desertification. A relatively modest grant is helping a researcher at the Pontificia Universidad Javeriana in Bogotá, Colombia, to produce clones of promising trees rapidly. She will use the in vitro tissue-culture technique that, in Brazil, has made it possible to produce 12.5 million seedlings within a short period as part of an enormous reforestation project. This is the third tissue-culture project — the other two are in Sénégal and Malaysia — to be supported by the Division in an effort to help developing countries master this advanced form of biotechnology. In Colombia, the supply of seeds is a bottleneck in reforestation programs. A grant will help the Corporación Nacional de Investigación y Fomento Forestal to stock and produce more seeds, and to collect seeds of important local tree species.

African foresters are also launching more and more reforestation programs and have to face the same seed supply problem. The Division has already given its support to the creation of a regional seed bank in Zimbabwe for the Southern and East African countries. In the past year, the Division made efforts to stimulate forestry research in three East African countries by offering a series of modest grants of \$10 000 — over 2-year periods — to researchers at universities in Kenya, Uganda, and Tanzania. Another activity administered by the Agriculture, Food and Nutrition Sciences Division is a 3-year reforestation project begun by an NGO in Botswana. Financing for this will come from a special \$10 million fund set aside for energy research, the management of which was entrusted to IDRC by the Canadian government.

The Division has also approved a project in an area of research that is currently arousing a great deal of interest — mycorrhiza. Mycorrhizae are symbiotic associations of fungi with



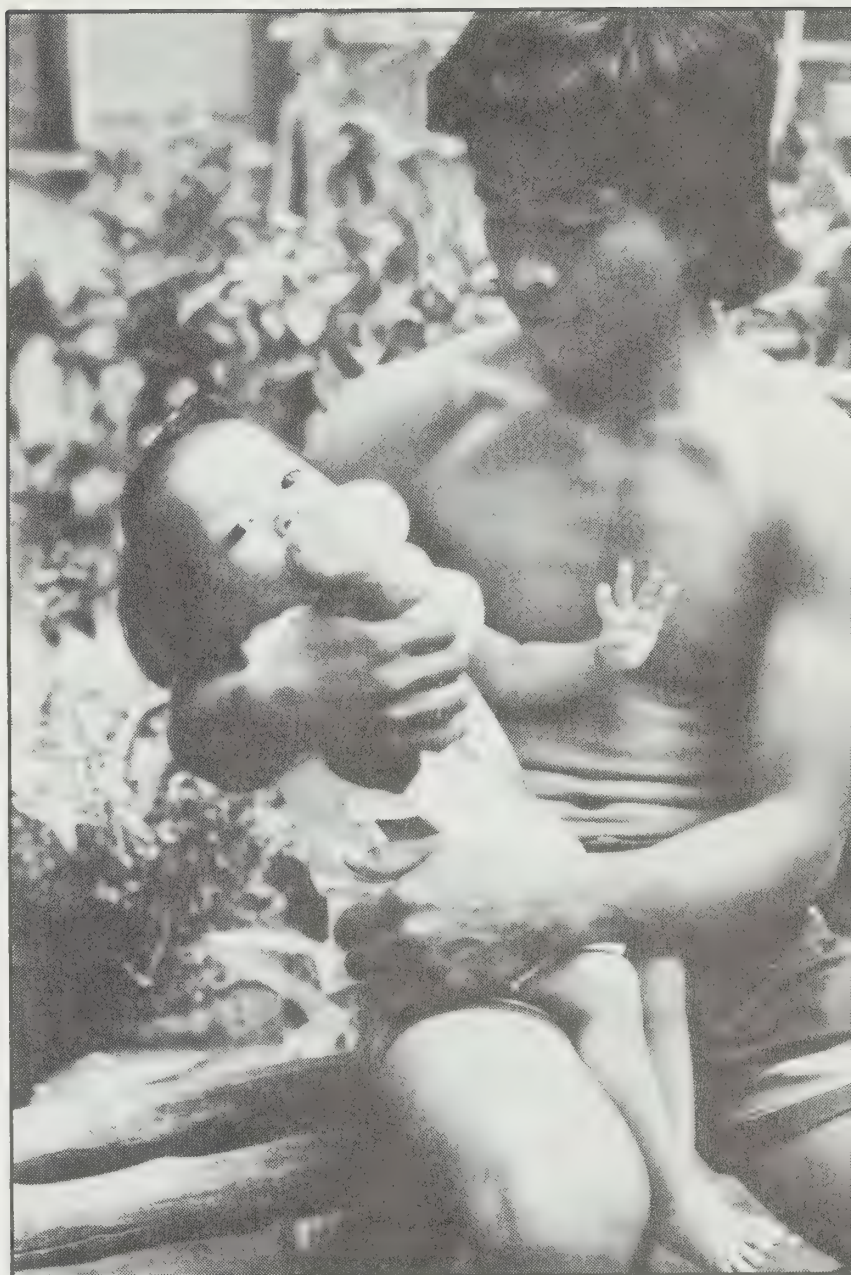
roots, ranging from those of the smallest vegetables to the largest of trees. They are now known to affect almost all plants. In essence, the fungi help plants to draw more phosphorus from the soil. Researchers at the Faculty of Forestry and Surveying at Laval University, in Quebec, have made notable advances in this field. They will be collaborating with researchers at the Division de recherche et d'expérimentation forestière de Rabat, in Morocco, in studying the mycorrhizae of Moroccan conifers.

During 1985, the Agriculture, Food and Nutrition Sciences Division funded a number of other projects that cannot be presented here for reasons of space. Many are further phases of projects that have been in progress for several years. Certain of the important programs in the Division brought forth fewer projects than others — the Agricultural Economics program, for example. Although this program was launched relatively recently, it has managed, among other things, to fund projects on cassava technology in Paraguay and cold storage facilities for vegetables in the Philippines. In a number of other cases, the program will enable economists to evaluate the relevance of research projects currently in progress.

Each new grant made by the Agriculture, Food and Nutrition Sciences Division is an opportunity for further reflection on how best to build scientific skills in the developing countries. Thus viewed, the Division's operations are themselves a form of research that we have tried to present here by going through the list of projects.

## The Needs of Children

Of the 220 000 births that take place every day, 90% are in the Third World. Although the chance of survival of these newborns has improved by 50% in the last 20 years, the first few hours, days, and months of their lives are still an obstacle course.



*Parents need more information on infant nutrition to feed their babies properly.*

From the time of birth, 20% of the children are underweight. That makes them vulnerable to viruses (yellow fever, measles, poliomyelitis), bacteria (tuberculosis, diarrhea, respiratory infections), and parasites (ankylostomiasis, schistosomiasis, leishmaniasis). Then comes the weaning period, when one out of four surviving children receives neither the quality nor the quantity of food needed to replace the sustenance provided by mother's milk. The result is that more and more children in developing countries reach adulthood with their health already largely impaired.

The Health Sciences Division of IDRC has to work in a context where each



defeat threatens to make one forget past successes. Their partners in the developing countries are the community and the researchers — the ones who know best about their own problems. In consultation with them, the Division's specialists find and fund the research that is most constructive.

### **The Ever-Successful Institute**

Even before birth, every child in the industrialized countries has a file that is continuously updated by medical staff and parents. When health services create these files, they automatically identify "high risk" children and pay greater attention to them. In a country with limited resources, no such system can be set up — unless communities take matters into their own hands. NGOs, which evolve directly from the community, are effective channels for putting in place measures to improve the health of women and children.

In several Asian countries, programs run by NGOs have been the most effective. One such NGO, the Yayasan Atma Jaya (the ever-successful institute) in Jakarta, Indonesia, has received funds from the Health Sciences Division to test health risk cards for pregnant women that can be kept up-to-date by traditional therapists, midwives, or the future mothers themselves. The information recorded on these cards makes it possible to identify which pregnancies run the greatest risk of complications.

In Thailand, India, and Jamaica, scientists supported by the Division are conducting research to identify the factors most commonly associated with high-risk pregnancies and perinatal deaths. The director of the Department of Social Medicine at Chulalongkorn University, in Bangkok, is studying cases of those particularly vulnerable children whose birth weight is below normal. In effect, researchers in these countries are looking for indicators to help identify high-risk groups so that governments

can spend their scarce resources where they will be most effective.

In the developed countries, infant mortality drops to an insignificant figure 1 week after birth. In the developing countries it remains high until weaning, which is a very critical stage. For economic reasons, milk is replaced with food that does not have enough protein. Infections, such as measles, whooping cough, parasitic diseases, and diarrhea, also weaken children, and a variety of taboos and prejudices about food further complicate matters. To learn more about weaning methods in Mali and West Africa, the Institut national de recherche en santé publique will undertake a study in three of that country's rural communities, thus enabling the government to determine the best measures for improving the situation.

The importance of this kind of information is also obvious in a country like Bangladesh, where the infant mortality rate from malnutrition is on the rise. One NGO, the Program for the Introduction and Adaptation of Contraceptive Technology (PIACT), will study the effectiveness and appropriateness of educational programs in teaching mothers how to feed infants. In the course of the study, PIACT will popularize the use of oral rehydration therapy. Despite its extreme simplicity — it consists of one part salt and 20 parts sugar dissolved in water — it is becoming one of the most effective ways to save infant lives in the Third World.

### **Communities Face Up to Schistosomiasis**

Technical solutions are no substitute for the united efforts of a community to tackle its problems. In the case of schistosomiasis (which is caused by a parasitic worm in the urinary tract, the intestines, or the liver) drug therapy has only a limited effect. And molluscicides for killing the water snails that transmit the parasite often cost more than governments can afford.

Wherever the incidence of the disease has been reduced, as in China, it has been because the whole community joined in to fight it.

In Zimbabwe, the Blair Research Laboratory, operated by the Ministry of Health, has received a grant from the Health Sciences Division to study the sanitary practices of families and school children in the community of Madziwa. Poor hygiene is a key factor in the transmission of schistosomiasis, because it is the excreta of infected people that contaminate the water. Technicians on the project will collect urine and stool samples to measure the rate of infection in the community and later identify sites that harbour the vector snails.

This information will help guarantee the community's huge investment in the project: the construction of 3600 latrines and 150 wells. Nurses and health workers will play a vital role in ensuring that the whole community actively participates in the project and also understands it. Finally, the state of health of the community members will be evaluated and compared with that of a control population so that the results of the experiment can be assessed.

In neighbouring Zambia, more than half of the 12 720 blind people, officially recorded in 1983, come from the Province of Luapula. The exact reasons for such a high localized incidence of blindness are not known. Three Zambian institutions are receiving support from the Health Sciences Division to measure the incidence of blindness in children aged six and under and identify the causes.

One of the suspected causes of blindness, *Chlamydia trachomatis* bacteria, will be the subject of a large-scale study involving small children in the rural regions of Egypt. The research will be conducted cooperatively by the University of Alexandria and McMaster University, in Hamilton, Canada. The project will also deal with the causes of respiratory diseases in a

region where the infant mortality rate is estimated to be 20%.

### African Health Specialists

The Health Sciences Division has gone to great lengths recently to increase the number of medical research projects it funds in Africa, where health needs are enormous. In four out of five countries there, the infant mortality rate exceeds 10%. Important efforts are taking place in several countries, including Togo where IDRC is funding two epidemiological studies. In one project, researchers are investigating guinea worm, a parasite that traditionally is removed from the body by rolling it very gently around a stick — an operation lasting from 1 to 4 weeks. The female worm sometimes reaches a length of 1.2 m. A second project focuses on another parasite, ankylostoma, which infests the gastrointestinal tract of small, underfed children.

### Traditional Healers

As part of a new program, the Health Sciences Division has funded a number of evaluations of existing health services in developing countries. Several of these studies take into account what traditional medicine has to offer.

In Haiti, the Division has agreed to fund a comparative study of traditional and modern medicine. The concept of primary health care advocated by the World Health Organization (WHO) calls for the participation of the community. In Haiti, herbalists, acupuncturists, midwives, and *hougans* (priest-medicine men) are an extremely influential group without whose help it would be futile to attempt to mobilize the rural communities. The Centre de recherches en sciences humaines et sociales, in Port-au-Prince, which has already conducted a well-received study on internal migration with the support of IDRC, will carry out this new project.

For about 15 years, the Health Sciences Division has been funding a host



of innovative experiments aimed at establishing basic health services of the kind proposed by the WHO. Teams in several countries have designed primary health care systems whose effectiveness must now be evaluated.

The University of Malaya, in Kuala Lumpur, will receive a grant to evaluate its model for primary health care before extending it into other regions of the State of Sarawak where it was designed. Based on community dispensaries (*klinik desa*), the system makes use of mobile voluntary teams, usually married couples, who work from manuals written in the local languages.

In Costa Rica, the Instituto Costarricense de Investigación y Enseñanza en Nutrición y Salud will study the impact of the numerous primary health care programs launched in that country during the 1970s. The project will permit researchers to conduct an in-depth analysis of statistical data already collected.

Further south, in Cali, Colombia, the Centro de Investigaciones Multidisciplinarias en Desarrollo Rural (CIMDER) received a substantial grant from IDRC to design a primary health care system adapted to rural conditions in Latin America. Under the CIMDER model, local health promoters, one from each community, are equipped with field knapsacks, each containing a complete, portable dispensary. One item in the medical package is a special measuring tape, now in widespread use, which can be used to measure the size of a child's arm to indicate his or her state of nutrition. Another substantial grant from IDRC will enable CIMDER to improve its model and measure its real impact. During this later phase, CIMDER will also serve as a training centre for interns from Bolivia and Ecuador, two countries that have begun to apply the CIMDER model and benefit from it.

For the past 12 years, the University of the West Indies in Jamaica has offered a 1-year course on public

health for young Caribbean doctors. The University is now conducting a survey to ensure that the training offered is still appropriate to the changing needs of the region. The Health Sciences Division is also collaborating with IDRC's Fellowships and Awards Division to finance the final phase of a program that has enabled about 30 Chinese doctors to take Master's degrees in epidemiology at Canadian universities.

### Oral Rehydration Therapy

Oral rehydration therapy can make a major contribution to reducing the number of infant deaths from diarrheal diseases and malnutrition. The precise relationship between diarrhea and malnutrition, however, is not known. Does diarrhea cause malnutrition, or vice versa? What is certain is that malnutrition weakens the defence mechanisms of the digestive system against several pathogens associated with diarrhea.

With funding from the Health Sciences Division, researchers at the Hospital Infantil Universitario Lorencita Villegas de Santos, in Bogotá, Colombia, will evaluate the way in which nutritional deficiencies limit the effectiveness of antidiarrheal treatments, particularly oral rehydration therapy. In 1985, the Division also decided to continue its assistance to WHO's Diarrheal Diseases Control Program via a second 2-year phase. Participation in this very successful WHO program has enabled the Division to become fully acquainted with the present state of research in this area and to identify national institutions suitable to receive funding support.

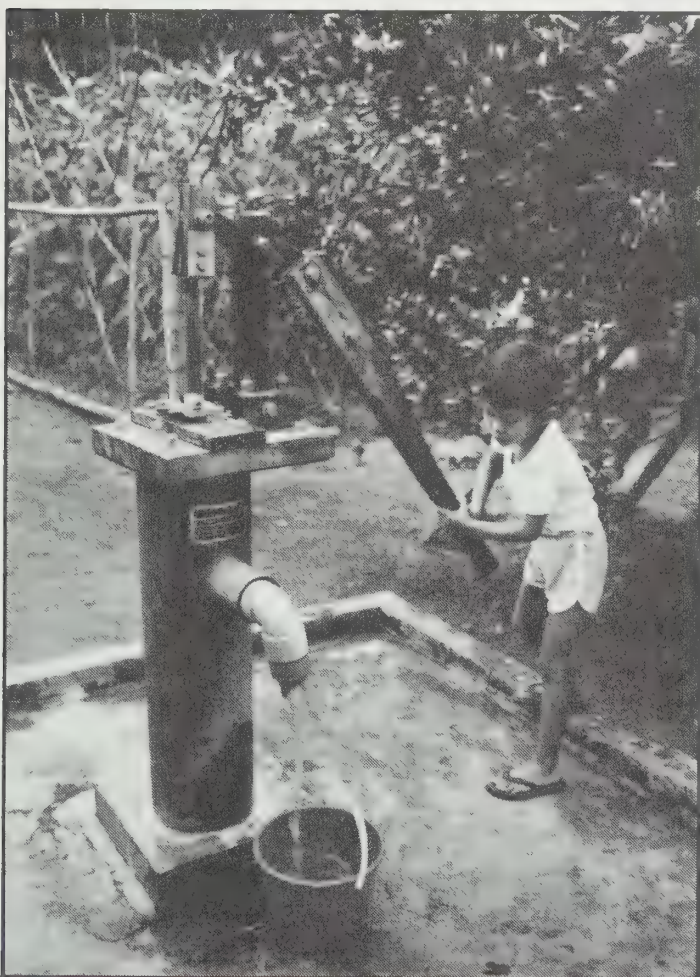
Another way to combat diarrhea is to ensure that a community has access to potable water. A small grant made under IDRC's Energy Research Program will enable researchers at the American University of Beirut to test a simple method of purifying polluted water by simply exposing it to sunlight in small transparent plastic containers.



Meanwhile, Philippine researchers from the National Environmental Protection Council will evaluate a treatment pond for the wastewater from several large, low-income housing projects in the suburbs of Manila. What is novel about the project is that the people who live in these districts will themselves be responsible for operating the ponds. The government's contribution will be minor.

### Providing Drinking Water

Among the Health Sciences Division's more successful endeavours is a series of projects, in six Asian and African countries, that has resulted in the development of a plastic handpump for water, which the Division is now promoting for commercial production. In August 1985, in Kuala Lumpur, Malaysia, an agreement was signed authorizing the University of Malaya to manufacture and market the pump



*These University of Malaya built UNIMADE handpumps are revolutionizing water supply in rural Malaysia.*

under the trade name UNIMADE. In Sri Lanka and Ethiopia, the pump has been the focus of an innovative experiment: women are manufacturing, installing, and repairing the pumps.

The Division also continues to support research into the supply of drinking water to rural areas. Often the difficulty lies in transporting the water into households, even though the source may be only a few metres below ground or at the foot of a slope.

In Kenya, Tanzania, Zambia, and Uganda, hydraulic ram pumps, powered by water pressure, are being used to lift water to a considerable height. Unfortunately, there are only about 20 manufacturers world wide and their pumps are expensive. The Health Sciences Division will provide a small grant to help a Ugandan engineer design an inexpensive pump that can be fabricated locally.

In Indonesia, the Division will give its support to Yayasan Dian Desa (rural light institute), an NGO that will use a special credit scheme to provide two villages with 40 handpumps. Families who buy one will pay 20% down and have a year to pay off the remainder. The credit scheme is intended to persuade the villagers to take more care in maintaining the pumps.

Another NGO, the Community Development Council, in Bo, the capital of Sierra Leone's Southern Province, has already been successful in introducing latrines and improved wells in several villages. With renewed support from IDRC, this new organization, made up almost entirely of volunteers, will expand its program into 15 more villages. The project should provide an excellent opportunity to evaluate the efforts of an African community to clean up its environment. In Mali, the Ministry of Public Health and Social Affairs will receive support from the Division to evaluate the impact of national programs, begun in 1979, for installing latrines in schools and villages.



In Southeast Asia, the agro-food industry, particularly hog raising, is developing rapidly. Over 8 years, the Health Sciences Division has provided a portion of the funds that have enabled the Pig and Poultry Research and Training Institute in Singapore to develop a technique for recycling wastewater from sties, and it has become a centre of excellence in the treatment of waste from the agro-food industry and regularly takes in trainees. The Fellowships and Awards Division and the Health Sciences Division are cooperating to fund the training of 20 engineers from the countries of the region.

### **Education for the Majority**

Families in rural areas are frequently willing to make large sacrifices to ensure that their children receive a valuable education. Often the students are sent into the towns to live with relatives or are placed in private schools even though this form of education is costly.

In sub-Saharan Africa, many of the public schools are in a deplorable state. Although the continent has largely exceeded its objectives for the number of university degrees awarded, the percentages of children who complete primary and secondary school are far below the stated goals of many governments. How long will the wish of historian Joseph Ki-Zerbo — that African universities not become “islands of future wealthy people surrounded by an ocean of obscurantism and wretchedness” — continue to be simply a wish?

Among other activities, IDRC’s Social Sciences Division supports the efforts of teachers in developing countries to bring education within reach of the majority, especially of young people in rural areas.

### **“Mushroom” Schools**

In Sierra Leone, the Centre for Research into the Education of Secondary Teachers will receive support from the Division to enable it to propose concrete

and realistic reforms to the Ministry of Education. In the first stage of its research, it has already thoroughly documented the failure of secondary education in Sierra Leone, which has been marked by the growth of private institutions called “mushroom” schools. In neighbouring Liberia, a small grant will enable a researcher at the University of Liberia to prepare criteria for the evaluation of primary school principals. And in Lesotho, a small grant to two researchers at the National University will fund an inquiry into a process of improvement begun by teachers who decided to accept the challenge of providing quality instruction.

Lack of school supplies, teachers, and infrastructure are not the only things that limit the effectiveness of child education in developing countries. In many families, children have to work because the income they generate, no matter how small, is indispensable. As long as parents are unable to make up that loss, they will not be able to send their children to school. The Institute of Education and Research, of the University of Dhaka, Bangladesh, will attempt to determine the shortfall in income that prevents the poorest children from getting an education. The results of the study will be most valuable because the government seems increasingly open to the idea of schools that set classroom hours that permit children to help their families or to earn money.

Several projects funded by the Social Sciences Division have enabled Latin American specialists to determine how society might best regain control of the education of its children, now that a tide of democratization is sweeping many countries of the continent. In Argentina, the Latin American Faculty of Social Sciences (FLACSO) will conduct an in-depth study of the mechanisms needed to allow parents, particularly in underprivileged districts, to participate in school operations. In Chile, the Programa Interdisciplinario de

Investigaciones en Educación, in Santiago, will seek ways of giving the users of public schools a greater voice in their operations. The present government has neglected the public sector, whereas private schools, which are inaccessible to the poor, have flourished. Researchers in the Caribbean are also interested in this kind of research.

The Division has funded the first study on the contribution of the school system to improving the lot of Jamaica's underprivileged. The Division has also agreed to fund several evaluations of teacher training in Jamaica, Uruguay, Indonesia, Thailand, and Pakistan. In the case of Pakistan, an experimental program of supplementary training for teachers has been set up by underprivileged people living in the north of the country. This IDRC-funded project will also show to what extent the program's design can be applied elsewhere.

### Traditional Learning

In one of the most innovative and original groups of projects approved by the Division, researchers are investigating the contribution made by community and traditional organizations to education. In Chile, the Centro de Documentación de Estudios en Educación (SUR) will conduct an in-depth study of the educational methods used by groups working in the most underprivileged areas. In Quito, Ecuador, the Centro Andino de Acción Popular will attempt to design new instructional methods based directly on the culture and traditional learning systems of Indian communities. The main objective of this new teaching scheme will be to transmit traditional knowledge about health, food, agriculture, and the marketing of agricultural products. Finally, in Morocco, a researcher at the Institut agronomique et vétérinaire Hassan II will carry out an in-depth study of the *msids*, the traditional Koranic schools that are flourishing again because of the general Islamic revival. This research should

supply valuable suggestions for improving these schools, particularly in the rural areas, as it is becoming increasingly important to find out how such institutions can complement the training given in the state schools.

These few paragraphs can hardly do justice to the hypotheses, ideas, and innovations of researchers devoted to improving the lives of Third World children. But perhaps they are enough to demonstrate the importance of research to help the most valuable asset the developing countries have: their children.

## The Needs of Local Enterprises

When it was established in 1970, IDRC had four program Divisions: Agriculture, Food and Nutrition Sciences; Health Sciences; Information Sciences; and Social Sciences. The range of the Centre's activities was enormously expanded with the inauguration in 1981 of the Cooperative Programs, which became a new program division 2 years later.

The Cooperative Programs Division funds research projects in which scientists from developing countries work with their Canadian counterparts. These are not technical-assistance projects; rather they are joint research activities distinguished by their collaborative nature and equality of partnership. In 1985–86, total funding for cooperative projects was \$15 million. About half of this went to projects under the direct guidance of the Centre's other divisions. The remainder was directly managed by the Division itself.

It was under the Cooperative Programs Division that two new and important subprograms of IDRC were created: the *Earth Sciences* subprogram, which has been active for several years, and the recently launched *Technology for Local Enterprises* subprogram. The latter is designed mainly to serve small- and medium-sized industrial enterprises. Apart from the requirements that each



project be appropriate to the country involved, and that the research team in the recipient country play the leading role, one of the essential criteria is the availability of well-developed Canadian scientific expertise in the project discipline.

In Canada there is, for example, what has been referred to as the "Chalmers' solidification school," named after an eminent Canadian metallurgist. Several of his former students now teach in Canadian universities and abroad. The Cooperative Programs Division will enable some of them, from the Laboratorio de Entrenamiento Multidisciplinario para la Investigación Tecnológica, in La Plata, Argentina, and from the University of British Columbia, in Vancouver, to work together. They will bring to Argentinian foundries the technology for manufacturing graphite cast iron in cupola smelting furnaces. Compact graphite cast iron is in great demand, and mastering the technique would open up a large market to small- and medium-sized Argentinian foundries.

In Venezuela, it is the aluminum smelting industry that will benefit from joint research at the Central University of Caracas and Queen's University in Kingston, Ontario. Researchers at these institutions will be investigating the effect of iron in aluminum-silicon alloy casting. The project will facilitate joint research on techniques to diminish the harmful effect of iron, which makes such castings brittle. The Cooperative Programs Division has approved three other projects in Argentina. The first links the University of Mar del Plata and the University of Alberta to create welding consumables for chromium molybdenum steels. The main product will be flux-cored welding consumables using metallic salts to protect electrodes from oxidization.

#### **Inexpensive Construction Materials**

The two other Argentinian projects

are part of a series of investigations into inexpensive construction materials for housing projects. Given the expected increase of 1.5 billion in the world population by the year 2000, 50 000 dwellings per day will have to be built globally for the next 15 years. Most of the population increase will occur in the developing countries where people cannot afford the cost of regular construction techniques and materials — particularly cement, the price of which has tripled in the last 5 years. Many Third World scientists are, therefore, looking for a substitute for cement or at least a partial replacement for it. In cooperation with two Argentinian groups, the Canada Centre for Mineral and Energy Technology (CANMET) will try to incorporate two kinds of industrial by-products into Portland cement, which is relatively expensive. One material is fly-ash, a by-product of coal-powered generating stations; the other is blast furnace slag, produced by steel mills.

In Brazil, the Institute for Technological Research, of São Paulo, will collaborate with scientists from the University of British Columbia in an attempt to maximize the amounts of rice husk ash and blast furnace slag that can be added to cements used in low-cost housing. Brazil produces 400 000 t of rice husk ash and 3 million t of blast furnace slag per year.

#### **Mastery of Composite Materials**

In 20 years, Mexico has increased its automobile production by 700% to almost 2 million assembled vehicles a year. The assembly plants belong to large multinationals, but half of the 850 manufacturers of auto parts are owned by Mexican interests. Because automobile technology advances rapidly, the Mexican parts manufacturers are in danger of losing some of their markets. The Cooperative Programs Division has agreed, therefore, to fund joint research by the Autonomous Metropolitan University of Mexico and a Canadian firm,



Metallurgical Consulting Services, of Saskatoon, into the manufacture of leaf springs using composite materials. Such “plastic” springs would weigh only one-fifth as much as regular springs, making for lighter and, therefore, more fuel-efficient cars.

### **Making Commercial Use of Coal**

Another Latin American country, Colombia, annually imports \$20 million worth of activated carbon, which is used, among other things, for water purification. A large sum in foreign currency could be saved if it were possible for small- and medium-sized firms to manufacture this product from coal dust as a result of a joint project of the Universidad Nacional de Colombia and the Royal Military College of Kingston, Canada. In another project, researchers at

the University of Sherbrooke, Quebec, and CANMET have already patented a process to make low-grade coals, such as lignite, marketable. Lignite is made to react with carbon monoxide and water, which transforms it into a smelting coal, coke. The patent is not very significant for Canada, which has large reserves of coking coal, but it will enable Turkish steel mills to reduce their production costs by 15–20%. The University of Cukurova in Adana, Turkey, will be the local partner.

In India, the boiler manufacturing industry will be the beneficiary of a contribution by specialists at the Technical University of Nova Scotia. The Canadians are working on a circulating fluidized bed boiler that uses low-grade, high-ash coal. If the project succeeds, India will gain hundreds of millions of



*We must build 50 000 housing units a day — mostly in the Third World — to shelter the world's burgeoning population.*



tonnes of additional coal reserves now regarded as useless.

The diversity of IDRC's cooperative activities is further illustrated by the range of topics covered in a number of other research projects now being funded: computer-assisted design of furnishings for low-cost housing (Hong Kong), the manufacture of instruments of measurement (Singapore), and the use of gaseous mixtures in high-voltage circuit breakers (China). Lastly, the Cooperative Programs Division is funding IDRC's first cooperative project in the field of law. This will be a comparative study of legal aid clinics in Colombia and Canada, to be administered by legal specialists in IDRC's Office of the Secretary and General Counsel.

Despite the wide range of projects, they all have one element in common: their purpose is not so much to transfer technology but to make a scientific contribution to create new knowledge. All of the partners are researchers not salesmen on one side and customers on the other.

### **Solid Foundations**

During 1985, the Cooperative Programs Division continued to fund earth sciences research.

The University of Sherbrooke will have the opportunity to work with the École Mohammedia d'ingénieurs, of Morocco, to study the "swelling clays" on which many neighbourhoods of Morocco's coastal cities are built. These clays can cause the collapse of one- and two-storey houses by expanding whenever they absorb water.

The same Canadian university will also collaborate with the École nationale d'ingénieurs de Sfax, in Tunisia, in the accurate mapping of wadis (riverbeds that are normally dry but can suddenly flood when torrential rains fall). Many houses in Tunisia's second largest city have been built on such watercourses. A map of the areas subject to this infrequent but often devastating flooding will make it possible

to formulate realistic preventive measures.

The Earth Sciences subprogram is largely concerned with hydrogeological research. This kind of work is extremely valuable because of the growing importance of groundwater and because there is, as yet, no clear understanding of how to utilize it rationally. In Bangkok, a study is being made of land subsidence because of the overuse of the groundwater under the city. Bangkok is only 1.5 m above sea level and is sinking 5–10 cm/year. Joint research by the Asian Institute of Technology and McGill University aims to design preventive measures with a view to developing the land to the south and north of Bangkok. Elsewhere, the National Directorate of Mines and Geology of Uruguay and the Université nationale du Bénin will be partners with the University of Québec in Montreal in a study of the rational use of underground aquifers. In both countries, this water is in danger of being depleted, which could eventually lead to contamination by salt water.

### **The Floating City**

The enormous metropolis of Mexico City is built on a dry lake bed beneath which are two aquifers, each from 3 to 5 m thick, separated by 40 m of alluvial soil. Some 300 million m<sup>3</sup> of water are drained annually, resulting in frequent land subsidence that, in turn, causes cracks in buildings and the rupture of water pipes. The Universidad Nacional Autónoma de México and the University of Waterloo in Canada are collaborating on the development of a computerized model of the aquifers that will provide critical information on the future of the Mexican capital, soon to become the largest city in the world.

On 19 September 1985, one of the most violent earthquakes in history struck Mexico City, killing many thousands of people. Apparently, the peculiar nature of the subsoil caused an amplification of the seismic waves, resulting in the collapse



*The many IDRC-supported studies help policymakers to make informed decisions.*

of many large buildings. In the poorer districts, the adobe houses (made of dried mud and straw) also collapsed. This type of traditional structure is extremely vulnerable to earthquakes and was partially responsible for thousands of deaths in Peru in 1970, in Nicaragua in 1972, and in Guatemala in 1976. Numerous programs have been undertaken to promote the use of other construction materials, but they have had little success. Now, researchers at the Pontificia Universidad Católica del Perú and Concordia University, Montreal, are trying a new approach. The aim of their project is not to replace adobe, but to reinforce it, so that this inexpensive material can be used to build safer houses.

### **The Desire for Joint Research**

When the Cooperative Programs were instituted, many people feared that IDRC would become less attentive to requests from the Third World. Indeed, in

the beginning, the majority of requests for cooperative research funds came directly from Canadian institutions, although the projects that were eventually approved all had developing-country institutions participating in the final design and execution of the research. Now, after 4–5 years of activities, the administrators of the Cooperative Programs are pleased that the proportion of requests directly from Third World institutions, alone or in association with a Canadian institution, has been rising. In 1981–82, the figure was only 34%; in 1982–83, it reached 67%; and in 1983–84, 80%. This clearly shows that Asian, African, and Latin American scientists are increasingly aware of the opportunities afforded by the program. In fact, even those IDRC staff who had doubted the usefulness of cooperative research now admit that Third World specialists seem keen to work with their Canadian counterparts. Despite this,



the major portion of Centre funds continues to be allocated to projects for which success rests entirely on the shoulders of developing-country researchers.

## The Needs of Decision-Makers

The results of IDRC-funded projects are usually aimed at the people who guide the future of their countries: the decision-makers. In the case of an improved variety of cassava, for example, the Ministry of Rural Development may have to decide whether or not to promote it. Or, if it is a new design of latrine, then the Ministry of Health may have to make the decision to release the funds needed to disseminate the technology.

This last chapter examines the role of research in the social and information sciences. Most work of this kind produces data and documents that cannot be used directly by the general public. The products of such research find application only when placed in the hands of those close to the centres of decision-making.

The political heads of developing countries are constantly inundated with advice, recommendations, and even outright demands that they follow a certain course of development action. These "inputs" very often have one thing in common: they all come from outside the country. As one African intellectual put it: "The relative inertia of governments and people alike can be explained by the lack of consensus that results from there not being any genuine internal debate about the measures to be taken."

If such debates are ever to occur, they will require a host of demographic, environmental, and economic data, as well as information about the impact of previous policies. For example, in India, which has been a veritable laboratory for testing development policies for the past 25 years, the extensive data that have been accumulated now make it possible to understand better the

reasons for the country's successes and failures.

If one had to provide a single *raison-d'être* for IDRC's Social Sciences and Information Sciences divisions, it would be that they provide the necessary foundation for genuine internal debate in developing countries. Decisions taken in the wake of these debates between citizens, political leaders, and indigenous specialists are much more likely to be realistic and capable of execution.

Many of the Social Sciences Division's projects are financially modest, but all of them serve to provide more experience and self-confidence to the future experts of the developing countries. In some cases, the projects involve isolated individuals; in others, the Division makes a concentrated effort and joins other donors in setting up what amounts to a full-scale "think tank." In almost all cases, the Social Sciences Division encourages university faculty, officials, and decision-makers in the countries concerned to work together to maximize the chances of the results being used.

## Helping Small-Scale Farmers

Agriculture is central to the most recent development theories. Once the production and income of farmers begins to increase, according to theory, a host of small rural industries springs up based on agricultural activities. Subsequently, this rural industrialization facilitates the birth and development of heavy industry in the cities.

A grant from the Social Sciences Division to the Centre d'études, de documentation et de recherches économique et sociale, in Burkina Faso, will enable researchers there to assess the growth potential of industries that process three agricultural products: peanuts, hides, and shea butter (a vegetable oil extracted from the shea tree). Researchers in the Department of Political Science at the University of Ghana, in Legon, will investigate contracts by which farmers sell their produce to

large companies that supply seeds, fertilizer, and technical assistance. Several important financial institutions are planning to invest in this contractual form of agriculture to stimulate the production of palm oil. First, though, it would be wise to determine the extent to which such contracts really benefit the farmers. Along the same lines, an economist at the University of the Philippines at Los Baños will investigate how risks are shared in contracts between small planters and transnational companies that export bananas and pineapples.

In the same area of research, a team from Al-Najah University on the West Bank will study six agroindustries to determine whether they have sufficient potential to attract local young people who, at present, are leaving the countryside to work in Israeli cities.

Another study, at Peradeniya University, in Sri Lanka, clearly demonstrates the importance of the economic research supported by the Social Sciences Division. The Government of Sri Lanka is currently preparing to promote milk consumption. According to the agricultural economist leading the study, however, such programs are not effective because, he argues, the demand for milk is not elastic. Here again only context-specific research can show whether his hypothesis is correct. Whatever conclusion is reached, the decision-makers will be quickly informed of it because the chief planner in the Ministry for the Development of Rural Industry is a member of the research team. In addition, the researchers will surely be anxious to exchange ideas with their colleagues at the Marga Institute in the capital, Colombo, who will be undertaking an input-output study to determine whether 12 villages, each in a different region, gain or lose in their overall economic activity.

### **Economics and Ecology**

Some of the research funded by the Social Sciences Division touches on issues

on which it is impossible to avoid argument. Agrarian reform, for example, is central to political life in the Philippines and is a subject on which the government has recently issued important decrees. Two studies, one by the University of the Philippines at Los Baños and the other by the Visayas State College of Agriculture (VISCA) Educational Foundation, will help to provide a better understanding of the economic situation of communities in areas of forest exploitation, particularly on lands recently distributed by the government on the island of Leyte. The researchers are trying to determine how it might be possible to ensure these communities a stable income and, at the same time, protect the environment. The population under study occupies marginal and fragile lands, often on mountainsides. They have, so far, eked out a living from them, but at the price of irreversible soil erosion and forest destruction. Most of the technical means for preventing environmental deterioration do exist, but a whole complex of socioeconomic conditions must be met if they are to be of any use. These studies will provide information on these necessary conditions, which relate to systems of land tenure, prices, grants, and regulations.

The Agriculture, Food and Nutrition Sciences Division and the Communications Division have linked up with the Social Sciences Division to help the Centre ivoirien de recherches économiques et sociales (CIRES) in Abidjan to develop as a centre of excellence in economic research for West Africa. CIRES will specialize in agricultural economics and seek out development models in which agriculture is instrumental.

The relatively modest contribution of the Communications Division to this project will be in the form of a grant to CIRES' quarterly publication. The editors of *Cahiers du CIRES* will also have an opportunity to improve their training in scientific and technical publishing at



two workshops organized by the Université d'Abidjan and supported by the Communications Division. This activity will enable 15 editors working on scholarly publications in French-speaking Africa to become familiar with the most recent technology in the rapidly changing world of publishing. The content of the workshops was established at a meeting of the trainees in Dakar in February 1985.

In Southeast Asia, the Agriculture, Food and Nutrition Sciences Division will join with the Social Sciences Division in supporting a series of socioeconomic projects on fisheries and artisanal aquaculture. The work will be conducted by researchers at six institutions in Indonesia, Malaysia, the Philippines, and Thailand. The International Centre for Living Aquatic Resources Management (ICLARM) will coordinate the numerous studies to be undertaken. This project, by itself, should result in the training of dozens of specialists who will provide Southeast Asia with a "critical mass" of researchers in the field of aquatic resources economics.

### **The Newly Industrialized Countries**

The 1960s and 1970s saw the rise of the so-called "newly industrialized countries," which usually include Brazil, South Korea, Hong Kong, Mexico, Singapore, and Taiwan. Their success upset so many pessimistic forecasts that they have been referred to as the "official miracle countries."

On the face of it, it seems improbable that a second generation of newly industrialized countries will soon appear. A number of factors united to favour the emergence of the first group. Industrial development in those countries coincided with rapid expansion of the world economy. Moreover, billions of petrodollars were recycled through banks that in turn made loans to Third World economies. Nowadays, the expectation is that there will be a decline in the growth rate of the world

economy. The banks are more cautious about making loans, and any second generation of newly industrialized countries will have to face competition from the first.

But for countries such as Colombia, Peru, Malaysia, Thailand, and Zimbabwe, which are aspiring to the title "newly industrialized," the future may not be quite so bleak as it now appears. In certain sharply defined industrial sectors, these countries are very competitive and they may be able to develop their economies by getting a toehold on specific commercial activities. Moreover, new forms of financing, such as joint ventures and guaranteed investments and loans, are being considered as ways to get capital flowing to poor countries again. Researchers from these five countries competing in the development race will examine these hypotheses in a project funded by IDRC and administered by the Overseas Development Institute (ODI) of London, England.

Meanwhile, specialists from the Indian Council for Research on International Economic Relations in New Delhi will have support from the Social Sciences Division for two important projects. The first involves planning a study on the industrial restructuring of India. The execution of the study itself may also subsequently receive funding. The second and parallel project consists of six sectoral studies on India's manufacturing industry. India stood up well to the oil industry shocks, first because of good budgetary measures, second by discovering and exploiting its own oil reserves, and lastly because of money sent home by Indian citizens working abroad. Nonetheless, the trade deficit is growing rapidly, and India's success may well be endangered if the country does not increase its exports. It is, in fact, surprising that a country with such large numbers of trained labour, experienced engineers, and administrators and skillful entrepreneurs does not play more of a role in the world trade of



*The economic crisis of recent years brought a number of Latin American projects to an abrupt stop.*

manufactured goods. It would seem that import substitution policies and measures to protect local manufacturers have favoured the development of a large number of industries but that they are not dynamic enough to tackle international markets. These studies will attempt to explain why Indian producers of diesel engines, pharmaceuticals, bicycles, motorcycles, air conditioners, and detergents are not more aggressive outside the country.

### **Coping with Protectionism**

The first generation of newly industrialized countries cannot afford to rest on its laurels. Thus, Singapore has to rethink its economic strategy and drop those industries that need a large labour force, in favour of advanced industries that employ highly trained personnel. The industrial reconversion of this Southeast Asian city-state is of great interest to

many neighbouring countries that will try to pick up the industries Singapore drops — thus the timeliness of the IDRC funding of the Institute of Southeast Asian Studies (ISEAS) to investigate the new industrial pattern that is emerging.

Another important project, a study of the constraints imposed upon the newly industrialized countries by protectionism, will be conducted by ISEAS in collaboration with the North-South Institute, Ottawa, Canada, as a cooperative project. And at Yonsei University, in Seoul, researchers will study the potential for countering protectionism by promoting exchanges of the same kinds of manufactured goods. Japan, for example, would sell cars to South Korea as well as buy them there. The significance of this kind of trade between industrialized countries suggests that it might be less susceptible to protectionist measures.

It sometimes happens that the process of industrialization in a country slows down, falters, and even regresses. Under the military government that ruled Argentina from 1976 to 1983, the informatics sector declined sharply. Foreign firms increased their share of the market from 30 to 80%, and employment in Argentinian electronic equipment firms collapsed from 13 000 to 4400. What is even more worrying for the future is that local firms practically abandoned research. Consequently, the Social Sciences Division is making a sizable contribution to a major study by the Asociación Argentina para el Desarrollo Tecnológico, which will provide the new government with recommendations on how to put the informatics sector back on track. The Division has also provided modest support to a researcher at the Latin-American Institute for Transnational Studies (ILET) in Buenos Aires to survey the literature on computerization in Latin America.

Again in Argentina, the former regime radically liberalized the money



markets. This resulted in the complete redistribution of wealth, shook the financial system to its core, and created a parallel economy that accounts for up to 30% of the GNP. One economist, who had previously received support from the Social Sciences Division, is now the principal economic advisor to the Argentinian government. The Division will continue to support his research team's work, the results of which are essential to the reform of the financial system. Meanwhile, the Division will also help Latin American specialists in Brazil, Chile, Colombia, and Peru to exchange results with their Argentinian colleagues. Those at the Universidad del Pacífico, in Lima, Peru, will receive two IDRC grants to develop an economic model of their country. During the last 30 years, Peru has tried out several models of industrial development, from the introduction of measures to stimulate exports, to the promotion of import substitution, to the neoliberalism of the last 5 years. Nonetheless, the country is now confronted with galloping inflation, coupled with a drop in production and in the real income of workers. If the researchers in Lima succeed in simulating the Peruvian economy on a computer, they will certainly attract the attention of the new government.

### **Readymade Solutions**

Despite the host of problems Latin America faces, it is at least blessed with a wealth of economic specialists. In East Africa, however, experienced economists are much rarer. The Social Sciences Division hopes to promote the development of greater economic expertise in the region by supporting a series of individual studies, seminars, and publications. In the long run, future African specialists will ensure that more reliable economic data are collected. In so doing, they will make it possible for the governments of the region to be more active in dealing with the numerous solutions suggested by foreigners.

The Division has also agreed to support two series of investigations designed to strengthen expertise in the area of science and technology policy in six African countries. The first series will enable researchers in Algeria, Ivory Coast, and Sénégal to study the potential contribution that the introduction of sugar refineries would make toward the development of their national technological capability. In the second series, researchers in Ghana, Nigeria, and Sierra Leone will receive grants to execute a number of case studies and share their experience at several workshops spread over 2.5 years.

In the area of energy, the Social Sciences Division, drawing on an IDRC fund designated for "Special Program Activities," will finance a network of researchers in Argentina, China, Costa Rica, and the Philippines. These four national teams will survey the various technologies used to produce energy in the rural areas of their respective countries. When the results have been collated and compared, the researchers hope to have an accurate picture of the types of energy sources best suited to rural situations. A separate study will enable the Tata Energy Research Institute (TERI), in New Delhi, to undertake a similar project in India.

### **Female Migrant Workers**

Over the years, the Social Sciences Division has funded numerous investigations into a variety of demography-related issues, such as fertility, access to the labour market, and migration. Recently, the Division supported a series of studies on the condition of women in rural regions. In Nicaragua, three researchers at the Centro de Estudios del Trabajo will try to learn more about the numbers and conditions of migrant women labourers employed in coffee- and cotton-growing areas. In Sri Lanka, the Centre for Women's Research will study the causes and consequences of migration by women looking for work. And in

Nigeria, a geographer at the University of Ibadan will study the socioeconomic consequences of large numbers of women leaving their villages in two areas of the State of Kwara. In all of these studies, the researchers will collect information on how these women reconcile the demands of their work with those of their traditional family roles.

At the moment, Africa has the highest rates of fertility. Kenya, for example, is experiencing a population growth of 4% per year, the highest in the world. Increasingly, the Kenyan government is openly supportive of the activities of NGOs, such as the National Council of the Churches of Kenya, which, since the 1970s, has been advocating birth spacing. In view of the growing interest in its activities, the Council will undertake a detailed study of the impact of its programs that have trained 1800 family planning teachers. In its efforts to encourage the training of demographers, the Social Sciences Division has joined IDRC's Fellowships and Awards Division in providing support to the Council for the Development of Economic and Social Research in Africa (CODESRIA) in Dakar, Sénégal. CODESRIA will set up a program to fund some 30 small-scale studies over a 4-year period. The grants will go primarily to promising young African researchers.

### **People Uprooted by Drought**

Alongside urbanization and the birthrate there are several other factors affecting the distribution of people in Africa. The droughts of the last 15 years, for example, have resulted in the appearance of numerous refugee camps and have forced nomadic populations to become sedentary, that is, to settle. In Mali, the nomadic Tuaregs make up only 7% of the population, but they own 40% of the livestock. The deterioration of climatic conditions has completely upset their traditional way of life. A study undertaken by the Office malien du bétail et de la viande will make it

possible to learn more about the patterns of nomad "sedentarization" in three areas of Mali. This will be the first study in an IDRC-supported network of research projects that will examine how the people of the Sahel are adapting to ecological change.

In the Caribbean, there is already a migration research network that links researchers at the campuses of the University of the West Indies in Barbados, Trinidad, and Jamaica. In one project supported by the Social Sciences Division, researchers are studying the migration of workers from the Caribbean to Canada. In fact, Toronto, Canada's largest city, is one of the two main destinations of emigrants leaving the Caribbean. The other is New York City. The purpose of the project is to provide an assessment of the migration issue that is sufficiently comprehensive to enable policymakers to predict future migration trends.

### **Storing Precious Data**

Management experts insist that businesses should attach great importance to communications if they wish to achieve excellence. They cite the case of a large U.S. firm that was so convinced of the importance of communication between employees that it had the layout of its head office designed in a way that would increase the opportunities for meetings and exchanges between staff members.

The Information Sciences Division of IDRC cannot remake the world. But it can make its resources available to those who want to help scientists and decision-makers obtain the information they need. Its support has made it possible to set up specialized documentation centres, libraries, and databases. The Division also supports a variety of experiments that are integral to the new global pattern of communications now emerging. Its main concern is to ensure that Third World specialists play a role in this new set of interconnections that is turning our planet into a "global village."



For some years, the Division has devoted a substantial part of its funds to promoting an international network of development information, DEVSIS. The only condition of membership in the network is that the prospective participant be engaged in the collecting of national documents. Each member makes the documents of its country available to the others. DEVSIS is an example of several international cooperative networks, the best known being AGRIS, an international information system on agriculture, run by the Food and Agriculture Organization (FAO) in Rome.

A sizable contribution will be made by the Information Sciences Division to the Marga Institute, in Colombo, Sri Lanka, to enable it to set up the nucleus of a DEVSIS network for Southeast Asia, DEVINSA, which will serve four other institutions in Bangladesh, India, Pakistan, and Nepal. The institutions in these countries will themselves function as network nodes serving some 60 institutions in the five countries. After a start-up period of a few months, DEVINSA should be ready to produce monthly printouts listing the documents stored at each participating institution. These documents will cover socioeconomic issues useful to planners, administrators, scientists, and policymakers in the countries of Southeast Asia.

In Venezuela, a regional institution, the Latin American Centre for Development Administration (CLAD), will also be able to establish itself as the nucleus of a Latin American information network on public administration with a grant from IDRC. Currently, 19 countries in Latin America and the Caribbean are members of CLAD.

In Guinea (Conakry), the second part of a grant from the Division will enable the country to continue collecting documents to set up the Centre national de documentation et d'information pour le développement, Guinea's first national documentation

centre. It will eventually link up with the DEVSIS international network, but its first priority will be to serve Guinean officials who, for years, have not had access to documents containing practical information.

Several of the Division's projects are designed to reinforce national structures. In the Northeast of Brazil, most of whose 35 million people live below the poverty line, the Centro Josué de Castro, in Recife, will set up a documentation centre specializing in information on the region's problems. In Sénégal, a grant will enable the Ministry of Health to restart its documentation centre. Likewise, research institutions in Mexico and Brazil will receive support from the Division to set up documentation centres specializing in women's issues and demography. These last two countries will then be able to join the Latin American Population Documentation System (DOCPAL), which will enable them to serve their own demographers better. The Division has also agreed to fund the publication of a biomedical research bulletin published by the Ministry of Health of Burma, as well as the Thai version of a bulletin produced by Chiang Mai University for the use of medical technicians.

### **Putting Micros to Work**

Several networks mentioned — DEVINSA, for example — are designed around minicomputers equipped with high-capacity hard disc drives. Under a new program dealing with information tools and methods, the Division will support research by the Latin American Demographic Centre (CELADE) in Santiago, Chile, into the use of microcomputers to process blocks of data from national censuses.

Only large computers, which are expensive to operate, have had the processing capacity needed to handle the masses of data that a census produces. But it is so expensive to process such data in this way that planners often quite

simply give up any hope of using these excellent sources of information. CELADE now hopes to test a method by which the information is broken down into subgroups and then stored in microcomputers. Such a breakdown — into regions, urban groupings, or city districts, for example — used to be possible only on a large computer. The subgroups, however, would be available on hard disc-equipped microcomputers. (Some hard discs have a storage capacity of 50 megabytes, the equivalent of 20 000 typed pages.)

A regional breakdown of data would be extremely useful if, for example, the Ministry of Health were planning to build a clinic in a given district. The decision-makers would have all the needed data available to them on a simple microcomputer: numbers of adults and

children, age pyramid, etc. There is no doubt that this would make it much easier for the ministry officials to get the answers to such questions.

Some Latin American NGOs are also planning to computerize and install telecommunications. In Chile, the Latin-American Institute for Transnational Studies (ILET) has set up the Network for Informatics Resources, in cooperation with 16 other NGOs. The Information Sciences Division will give them the necessary support to enable the various members' microcomputers to communicate with each other and, eventually, with similar organizations in Brazil, Peru, and Central America.

### Teleconferencing

The United Nations University, Tokyo, Japan, will be the beneficiary of a



*If research information is collected and managed properly, we can prevent duplication of scientific effort.*



grant to evaluate the usefulness of a teleconferencing network for the exchange of information between specialists in brucellosis, a cattle disease. In the network prototype being planned, computers will store messages so that they are accessible at any hour of the day or night to the other participants. Such "asynchronous" conversations hold out great promise as a means of dialogue between researchers. In fact, previous experiments supported by the Division showed that such teleconferencing allows Third World researchers to deal with their colleagues in the industrialized countries on an equal footing. Eventually, these networks could breathe a new dynamism into the work of developing-country scientists who often work in isolation, cut off from sources of information.

The Information Sciences Division has also begun to support software research. One package, designed by the Commonwealth Secretariat with the help of a grant from IDRC, has attracted a great deal of attention from policymakers because it makes it possible to obtain a complete profile of a country's debts. Until now, developing countries had to manage the various components of the national debt manually, or refer back to the lending banks themselves, which until very recently were the only places where the necessary software could be found. A project approved by the Division will enable the External Resources Department of Sri Lanka to try out the software in the management and analysis of its foreign debt.

### **Specialized Information**

In the agricultural sector, the Information Sciences Division supports numerous efforts to disseminate scientific and technical information. Some of the projects were inspired by experiments that were successful elsewhere. For example, grants have been approved for the establishment of specialized documentation centres: on potatoes, at the

International Potato Center (CIP) (Peru); on coconuts, at the Coconut Research Institute (CRI) (Sri Lanka); on mangroves, at the Natural Resources Management Centre (Philippines); on weeds, at the Southeast Asian Regional Centre for Tropical Biology (Indonesia); and on postharvest techniques, at the Centre ivoirien de recherches technologiques (Ivory Coast).

In some cases, research leaves the beaten track. These are usually highly original experiments with invaluable potential. The Division has just approved a request from SACCAR, in Botswana, to set up an information centre to serve the countries of the SADCC. The Conference was established to foster economic cooperation among its members and in response to the drought that has seriously affected Southern Africa. The members are Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia, and Zimbabwe. In another original experiment, in Nepal, support is being given to Agricultural Projects Services Centre (APROSC) in Kathmandu, to produce a lexicon of plants and animals in Nepali, the official language. At the moment, there is much confusion because of the large number of local dialects. This glossary will be an invaluable tool for communication between the local populations, extension workers, and scientists.

The Royal Nepal Academy of Science and Technology (RONAST) has support from the Communications Division in launching an experimental program of science popularization for the radio and print media in Nepal. Twenty radio journalists and 20 print journalists will be trained under this project, which represents the first real penetration of the Nepali media by locally produced information on science and technology.

### **Letting the Taxpayers Know**

When the People's Republic of

China decided to catch up on the technological lag that resulted from the Cultural Revolution, it gave priority to scientific research. Not only were researchers sent back to their laboratories and the resources available to them increased, but efforts were made to reintroduce science and technology into the country's culture. The Chinese government also decided to make the popularization of science a priority. Numerous publications were launched and even Chinese translations of popular foreign publications on science were enthusiastically welcomed.

Even if their contexts differ sharply, many developing countries would like to ensure that scientific and technological information is not the exclusive property of a small minority. IDRC's Communications Division has modest funds at its disposal to respond to the requests of countries that wish to experiment with popularizing national and international scientific research.

In Peru, the Grupo de Estudios para el Desarrollo has received a grant from the Division to train Peruvian journalists in the better dissemination of scientific and technological information relevant to the country's development. These professionals may eventually collaborate in the new Spanish-language science news service that the Agencia Latinoamericana de Servicios Especiales de Información has just started with a grant from IDRC. Across the Pacific, the Philippines News Agency has been able to re-start its science news reporting service thanks to a training workshop for 20 journalists funded by the Communications Division. Elsewhere in Asia, the Division has already contributed to the organization of two workshops in science programing for television professionals by the Asia-Pacific

Institute for Broadcasting Development (AIBD), one in Kuala Lumpur, Malaysia, and the other in Colombo, Sri Lanka.

In Africa, a training workshop for 20 educators from schools of journalism and communications in the nine member countries of the SADCC could have a significant multiplier effect in promoting science journalism in the region.

One project that can serve very well as a final note on which to conclude this description of the activities of IDRC is the grant given by the Information Sciences Division to the African Intellectual Property Organization (OAPI) at Yaoundé, Cameroon. IDRC's contribution will be used to build up the Patent Documentation and Information Department, and its regional branches. By becoming more efficient and making its information more readily accessible and of higher quality, OAPI will greatly increase the credibility of patents registered in Africa. Over time, this service will help to bolster the creative activity required to fulfill Africa's technological needs.

The central theme of this publication can be stated in a single sentence. Indigenous scientific and technological creativity that produces relevant research results must be fostered in the developing countries to ensure that the needs of their people are truly met. IDRC is only one of many agents in an enterprise unique in the history of mankind — the effort to exchange not only goods or even knowledge but to share the mechanisms and methods by which new knowledge is generated. To achieve this, IDRC makes use of all possible channels, whether they be international, regional, or national institutions.



# PUBLICATIONS AND FILMS

## Books

**IDRC annual report 1984–1985/Rapport annuel CRDI 1984-1985.** 96 + 90 pp. IDRC-003/85e,f

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**Centro Internacional de Investigaciones para el Desarrollo: proyectos 1970–1981.** 384 pp. IDRC-180s  
(Also available in English, IDRC-180e, and French, IDRC-180f)

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**La toxicité du manioc et la thyroïde : recherches et questions de santé publique : compte rendu d'un colloque tenu à Ottawa, Canada, du 31 mai au 2 juin 1982.** F. Delange and R. Ahluwalia, editors. 162 pp. IDRC-207f  
(Also available in English, IDRC-207e, and Spanish, IDRC-207s)

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**Vivienda básica: políticas sobre lotes urbanos, servicios y vivienda en los países en desarrollo.** A.A. Laquian. 174 pp. IDRC-208s  
(Also available in English, IDRC-208e, and French, IDRC-208f)

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**El ambiente de investigación educativa en países en desarrollo.** S. Shaeffer and J.A. Nkinyangi, editors. 326 pp. IDRC-213s  
(Also available in English, IDRC-213e, and French, IDRC-213f)

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**Plantes-racines tropicales : culture et emplois en Afrique : actes du second symposium triennal de la Société internationale pour les plantes-racines tropicales — Direction Afrique, 14–19 août 1983, Douala, Cameroun.** E.R. Terry, E.V. Doku, O.B. Arene, and N.M. Mahungu, editors. 234 pp. IDRC-221f  
(Also available in English IDRC-221e)

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**Small-scale fisheries in Asia: socioeconomic analysis and policy.** T. Panayotou, editor. 283 pp. IDRC-229e

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**L'université rurale : éducation et développement.** F. Arbab. 85 pp. IDRC-231f  
(Also available in English, IDRC-213e, and Spanish, IDRC-213s)

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**Finfish nutrition in Asia: methodological approaches to research and development.** C.Y. Cho, C.B. Cowey, and T. Watanabe. 154 pp. IDRC-233e

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**Irrigated forestry in arid and semi-arid lands: a synthesis.** F.B. Armitage. 160 pp. IDRC-234e

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**Searching: IDRC 1984 — the rural experience.** 40 pp. IDRC-235e  
(Also available in French, IDRC-235f, and Spanish, IDRC-235s)

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**Women's issues in water and sanitation: attempts to address an age-old challenge.** 104 pp. IDRC-236e

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**Pasture improvement research in Eastern and Southern Africa: proceedings of a workshop held in Harare, Zimbabwe, 17–21 September 1984.** J.A. Kategile, editor. 508 pp. IDRC-237e

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**Chinese-character processing for computerized bibliographic information exchange: summary report of an international workshop held in Hong Kong, 17–20 December 1984.** T.C. Ting, editor. 68 pp. IDRC-239e

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**Devindex 1984: Index to selected literature on economic and social development/Index d'ouvrages sur le développement économique et social.** 172 pp. IDRC-240e,f

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**International computer-based conference on biotechnology: a case study.** D.A. Balson, editor. 103 pp. IDRC-241e

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**Research methodology for livestock on-farm trials: proceedings of a workshop held at Aleppo, Syria, 25–28 March 1985.** T.L. Nordblom, A.K.H. Ahmed, and G.R. Potts, editors. 313 pp. IDRC-242e

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**Comercialización interna de los alimentos en América Latina: problemas, productos y políticas: selección de las ponencias presentadas en un seminario internacional**

celebrado en el Centro Internacional de Agricultura Tropical en Cali, Colombia, 11-13 julio 1984. G.J. Scott and M.G. Costello, editors. 253 pp. IDRC-243s

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Laboratory and field testing of handpumps. Goh Sing Yau. 138 pp. IDRC-TS51e

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Recommended methods for development-information systems, Volume 2: Guidelines for the building of authority files in development-information systems. A. Di Lauro and M. Sly. 204 pp. IDRC-TS52e

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## Magazines

The IDRC Reports/Le CRDI Explore/El CIID Informa are quarterly magazines that present IDRC's activities in the form of articles dealing with the fields in which IDRC is active. They are published in French, English, and Spanish. The total circulation is 24 000 and is distributed free to decision-makers and

researchers in the Third World, Canada, and the industrialized countries.

## Films

### Trees of Hope

In some African countries, 90% of all energy requirements comes from firewood. Unfortunately, consumption for human needs outstrips natural regeneration, and hungry animals attack the remaining vegetation. When the rains fail, the desert advances.

The IDRC film *Trees of Hope* documents this rapid deforestation and analyzes various solutions such as shifting to solar energy and improving traditional stoves. It emphasizes the importance of reforestation using the example of a village woodlot project in Niger where foresters have exchanged their traditional role of wardens for that of rural-development workers. The 18-minute film, produced by IDRC's Communications Division, was shot on location in Niger, Mali, Sénégal, and Nigeria.



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# SEARCHING

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# SEARCHING

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## Partners in Innovation

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# INTRODUCTION

Commodities have always formed a structural centre-piece in the economies of developing countries. These products are sometimes minerals, but more often are of agricultural origin. Their existence was in many instances the excuse for colonization in centuries past; their exploitation often to the neglect of other economic activity — including even the production of food crops for local consumption — continues today to be a major challenge to economic planners. A common goal of governments is the diversification of economies to decrease dependency on commodities as a source of foreign exchange. Notwithstanding those efforts, primary products still account for more than 35% of the value of all developing-country exports. For those countries designated by the United Nations as “least developed,” the figure is 73%.

Commodity dependency has never been a satisfactory circumstance. It is even less so for those countries that export a single primary product. In addition to all of the environmental hazards faced by farmers worldwide — uncertain rainfall, inadequate soil nutrients, pestilence, access to credit — the issues of effective demand and price are ever present. As farmers and consumers have known for millennia, produce prices are as supple as the stem of a rice plant. Governments that depend on income generated by sales of commodities in world markets face the fact that their economies are hostages to fortune.

In recent years, the fortune has not been bright. A number of factors, not all as yet fully understood, are responsible. For example, the same technologies that have



*An informatics specialist explains to IDRC's President, Ivan L. Head (right), the functioning of data banks.*



contributed to extraordinary gains in agricultural production in Asia in recent years have also permitted immense efficiencies and yields in the traditional grain-exporting nations; a number of industrialized countries have recently adopted agricultural policies that heavily subsidize farm produce; manufacturers are increasingly turning to lower cost synthetics and other substitutes in place of traditional raw materials, be they of fibre or mineral origin; and protectionism in many industrialized countries is now limiting access even to classical nonvalue-added items.

The combination of these circumstances has led to a precipitate drop in commodity prices. All commodity producers, from all parts of the world, are affected. But placed at highest risk are the less-resilient economies of the developing countries. Since 1980, the prices of primary commodities have dropped at an annual average rate of 7.4%. Not counting oil, dollar prices for tropical commodities are now some 30% lower than their 1980 levels. The loss of income to developing countries in 1985 alone is estimated at US \$50 billion. Because these countries for the most part service their foreign debts with funds earned by the export of their commodities, their ability to keep their payments current is severely affected. For reasons quite beyond their control, interest rates have risen while commodity prices have fallen.

To understand better these economic circumstances, developing countries are conducting their own research programs and are acquiring the competence to devise more effective policies and to choose wisely from the limited range of options open to them. Research of this sort demands an ability to access large masses of statistical information and to utilize sophisticated computer techniques for its proper analysis. Research of this kind won't raise commodity prices, but it may permit wiser responses to threatening circumstances.

In an earlier and seemingly less-complicated age, Thoreau argued that "it is not enough to be busy, the question is, what are we busy about?" The pages that follow reveal what developing-country researchers have been busy about, and how IDRC has supported their endeavours.

*Ivan L. Head*  
*President, IDRC*

# WHAT IS IDRC?

The International Development Research Centre (IDRC) is a corporation created by the Parliament of Canada in 1970 to stimulate and support scientific and technical research by developing countries for their own benefit.

The fields of investigation to which IDRC gives its financial and professional support include farming; food storage, processing, and distribution; forestry; fisheries; animal sciences; energy; tropical diseases; water supply and sanitation; maternal and child health; education; population studies; economics; urban policies; science and technology policy; information systems; earth sciences; and dissemination of research results.

Although IDRC is funded entirely by the Canadian Parliament, to which it reports annually, its operations are guided by an international 21-member Board of Governors. Under the IDRC Act, the chairman, the vice-chairman, and 9 other governors must be Canadian citizens; in practice, 6 of the remaining 10 governors are from developing countries.

The Centre's programs help developing countries to build the scientific competence of their institutions and their researchers so that these countries can work to solve their own problems. Opportunities are given to researchers to broaden their experience through practical work assignments or advanced studies.

IDRC emphasizes the role of the scientist in international development and encourages Third World countries to draw on the talent of their own scientific communities. Building a strong local base for future research is an important objective of most IDRC-supported work. Research projects are identified, designed, conducted, and managed by

developing-country researchers in their own countries, to meet their own priorities.

IDRC helps to create and supports international research networks through which developing countries can learn from each other, share common experiences, and conduct similarly designed studies in areas of mutual concern. It also promotes cooperation between developing-country researchers and their counterparts in Canada.

## Research Programs

**Agriculture, Food and Nutrition Sciences** — In this group of related sciences, emphasis is on farming systems, social forestry in arid and semi-arid lands, and aquaculture. Specific areas of support include previously neglected food sources such as root crops, food legumes, and oilseeds; agroforestry (growing trees and crops together); multiple cropping systems; improvement of pasturelands; use of nonconventional feeds for animals; fish and shellfish farming; postproduction systems for the preservation, processing, and distribution of food crops, fruit, and fish; and the economics of small-scale farm production and marketing.

**Health Sciences** — The division's support is concentrated in five broad areas of applied research: health services; water supply and sanitation; maternal and child health; tropical and infectious diseases; and occupational and environmental health.

**Social Sciences** — Research supported by the division is designed to improve understanding of the social and economic issues related to international development, permitting researchers and policymakers to formulate policy options in several thematic areas. These include



education, population, science and technology, energy, urban development, economics, and rural development. Support is also given to a limited number of national and regional institutions in the social sciences and to research on problems of special regional concern.

**Energy** — In 1981, the Canadian government decided to grant IDRC an additional \$10 million to enable it to finance a greater number of energy-related research projects. Most of this supplementary fund has already been allocated to projects, and within the next 2 years the whole amount will have been used. IDRC will, however, continue to support energy research. The energy fund has made it possible to pay closer attention to issues such as energy policy and the evaluation of energy sources, supply mechanisms, patterns of consumption, and alternative technologies in developing countries. Several projects designed to make use of renewable energy for domestic needs (cooking food, supplying water) and in farming (drying the harvest) have been approved. IDRC has also financed regional information centres that specialize in energy-related topics and has granted several training awards in the field of energy. Also, working with the United Nations University in Tokyo, the Centre made a contribution to the establishment of a prestigious international Energy Research Group whose final report will be published in 1987.

## Information Programs

**Information Sciences** — Support given by the division helps developing countries to establish regional and national information systems and improve library infrastructures at these levels; participate in international information networks; create specialized information centres (serving the region or world) on development-related subjects; strengthen sectoral information programs, especially in agriculture, health, population,

industry, the environment, cartography, and social issues; and develop information tools and methods. The division's computer systems group provides internal services and distributes MINISIS, a bibliographic software package designed by IDRC, to developing countries. In addition, a library and micrographics unit serve IDRC staff, the Canadian development community, and IDRC-supported projects.

**Communications** — Services provided by the division include the publication and dissemination of the results of IDRC-supported research via print and film media, public affairs, and translation. The division also aims at strengthening the ability of research institutions in developing countries to prepare and disseminate scientific and technical information particularly on projects supported by IDRC.

## Collaborative Programs

**Cooperative Programs** — The division promotes collaboration between scientific research groups in developing countries and their counterparts in Canada — whether academic, governmental, or private. By establishing channels of communication among scientists, the division helps improve the transfer of research results from Canada to the Third World. Project support is, however, open to all disciplines that contribute to Third World economic or social development and in which there is recognized Canadian expertise. It is important that the developing-country research group plays a significant role in formulating a scientifically sound project proposal and in planning and executing the project, thereby strengthening its research capacity.

**Fellowships and Awards** — The division funds the training of junior and senior Third World scientists, managers, and planners working in sectors covered by IDRC's program divisions. Preference is given to individuals from the least-



*Well-informed and motivated mothers have a major role in decreasing infant mortality rates.*

developed countries and the emphasis is on professional upgrading rather than basic training. In addition, the division supports practical, nondegree group training to improve technical, research, and administrative skills of individuals. A portion of the division's funds is also used to encourage the involvement of young Canadian researchers in scientific areas of concern to IDRC and to expose them to the problems of the developing world. These doctoral students are posted to a Third World country for studies, research, or placement.

### **Funding and Selection of Projects**

Each program division channels funds to institutions in developing countries (government departments, universities, research centres, etc.), to international and regional institutions, and to Canadian

institutions. The recipient is expected to pay a portion of the costs.

All projects are reviewed by IDRC's professional staff and assessed in light of factors such as

- Development priority: Is the proposal consistent with national or regional development goals?
- Regional applicability: Are the research findings likely to be applicable in developing countries or regions other than the one in which the research takes place?
- Usefulness: Will the research help close gaps in living standards or lessen the imbalance in development between rural and urban areas?
- Local resources: Will the project make full use of local resources and research workers from the region?
- Training: Will the project result in better trained and more experienced



researchers and more effective research institutions?

- Research area: Does the research fall within IDRC's areas of concentration?

When IDRC agrees to support a project, it enters into an agreement with the developing-country institution. In it are stipulated the project's purpose, research methods, payments, and a schedule for the research and progress reports.

## The Program Officer

Although IDRC itself rarely undertakes research, its program officers are highly qualified professionals. One of their main functions is to respond to project ideas proposed by developing-country researchers and to evaluate the suitability of proposals in light of the criteria stated earlier.

Once a project has been approved in principle, the program officers collaborate with the institution submitting the proposal in further refining the project idea, provide administrative and technical advice, and help in preparing a project budget. Program officers are based either at IDRC headquarters in Ottawa or in one

of the regional offices. In the regions, they help determine research priorities and prepare detailed annual plans of projects to be defined and developed, workshops and seminars to be organized, and maintain contact with research institutions throughout the region.

## Project Approval

Before funds are appropriated, a project proposal must go through a formal approval process.

Authority to approve projects for which funding exceeds \$100 000 lies with IDRC's Board of Governors. It delegates approval authority to the President and the Vice-Presidents for projects up to \$100 000, to Directors of individual divisions for projects up to \$50 000, and to Deputy Directors for projects up to \$15 000.

When a project has been approved, funds are appropriated by the Office of the Comptroller General and Treasurer. The Secretary's Office prepares a Memorandum of Grant Conditions (MGC) governing all aspects of the relationship between the signing parties. Once the MGC has been signed by the recipient, funds can be forwarded.

# EXTERNAL SUPPORT OF RESEARCH

The search for new knowledge and alternative ways of applying what is already known is a vital component of the development process. The contribution that relevant research can make to development has been increasingly recognized by Third World countries.

This introductory section will review some features of Third World research, focusing particularly on the contribution of development assistance in the field of research and on some attempts that have been made to assess the impact of research. It borrows heavily from data on some donor agencies' funding of development research collected by Professor John P. Lewis, who was Chairman of the Development Assistance Committee (DAC) of the Organisation for Economic Cooperation and Development (OECD) from 1979 to 1981, and from a preliminary report he has written for IDRC. (Professor Lewis is not responsible for the way material is presented here.)

The role of research has not always been perceived as clearly as it is today. In the 1950s, in the early days of what has now become the "economic development field," dominant theories of economic growth were so capital centred that they seemed to slight the effects of everything else. This itself was ironic, for, at that very time, econometric studies of the sources of growth in the industrial economies were finding that changes in the quantities of capital and labour explained only small fractions of growth performance. Instead, most of the latter reflected increases in the productivity of these physical factors. In turn, many of the productivity advances plainly were caused by the improving technology that was being generated by ongoing fundamental and applied research.

This view of the salience of research spread quickly to the Third World. It extended to almost all sectors. Agricultural progress was seen to hinge on supplying new technologies. The Green Revolution was research intensive. Industrial, energy, and transport advances reflected the abilities of applied research to adapt or innovate appropriate technology. Health and population programs were full of unanswered questions. The shape and context of optimal education programs and, indeed, the very role of education in development demanded analysis. The Third World was confronted by a major requirement for economic and other policy research. At the same time, it was clear that it could not rely solely on research imported from industrial countries; such knowledge had been generated and its application undertaken in an environment that differed markedly in terms of ecology, resources, characteristics of available factors of production, and social and cultural values. There were abundant examples of technology being incorrectly applied and inappropriate solutions being imported into developing countries.

This of course did not imply that developed-country research was irrelevant for developing countries, but that careful judgment of its usefulness in sometimes radically different circumstances was required. In addition, developing countries were faced with intractable problems that were of little or no importance to the so-called developed world.

The bulk of research undertaken in developed countries has been concentrated in sectors that play little role in the economies of developing countries. Thus, it was essential for developing countries to build up their capacity, both



to undertake research and to judge the quality and appropriateness of research undertaken elsewhere. This development of research capacity implied building new institutions and providing training and opportunities for on-the-job experience to individual researchers.

## R&D in the Third World

It is extraordinarily difficult to provide an assessment of the amount of resources — both financial and human — that the Third World devotes to research. Where estimates exist, they are seldom constituted on a comparable basis; indeed, comparison of different sets of data may well reveal major discrepancies. There is a great need to improve the data available in this area. A distinguished observer, Mahdi Elmandjra, noted recently that “it was not until 1978 that the General Conference of the United Nations Educational, Scientific and Cultural Organization (Unesco) adopted the recommendation on the international standardization of statistics on science and technology. It will take many more years before we can dispose of relatively reliable and internationally comparable data on research and development expenditures.”

Those estimates that do exist on developed- and developing-country overall expenditure on research and development (R&D) provide some basis for making a number of major points — such as the stark contrast between the proportion of world R&D expenditure being realized in and for the two sets of countries. It is at the individual country level, however, where major decisions must be taken about the allocation of resources to research, that the need for better information is most crucial. Along with others, IDRC hopes to play a role in facilitating the collection of information and quantitative data by countries to assist in planning future research expenditure.

In the case of agriculture, most countries have a better picture of the

resources devoted to research than for other sectors, although even here the information is incomplete. The International Service for National Agricultural Research (ISNAR) is developing a data base designed to provide comparative information on agricultural research throughout the developing world; data will be based, where possible, on responses from countries themselves, supplemented by information from other primary and secondary sources.

Notwithstanding the difficulties of finding or collecting data in this area, there are a number of preliminary statements that can be made to provide a sense of the situation:

- One of the earliest estimates (in the 1960s) in this area was that developing countries accounted for 2% of world R&D expenditure. An estimate was made for 1973 and gave the same ratio as being about 3%.

- Unesco data shown in the 1985 statistical yearbook suggest that developing countries accounted for 2.3% of R&D expenditure in 1970 and for as much as 6% in 1980. Similar data on numbers of R&D scientists show developing countries with 7.9% of the total in 1970 and 10.6% in 1980.

- There is a major imbalance between the proportion of worldwide research undertaken in the Third World and its share of world population (81%) or of combined world production (21%). The figures show that over the last 20 years there has been some small reduction in this imbalance; however, the developing countries, as a whole, continue to invest usually less than 0.5% of gross domestic product (GDP) in research activities, whereas the corresponding figure for the leading developed countries is 1.5–2%.

- More detailed estimates exist for agricultural research; however, even here there is a range. In 1979, one study estimated that 15% of global expenditure on agricultural research was spent in the

developing countries; another study completed shortly after suggested that one-quarter of global agricultural research was related to expenditures in the developing countries.

- Most studies indicate that, whatever the relative proportion of R&D expenditure in developing and developed countries, the absolute amounts spent in this field by developing countries have increased enormously in the last 20 years. In agriculture, a study covering the data for 67 developing countries estimated that, in 1980, expenditures on agricultural research at 1975 prices were in the order of \$1082 million, 71% higher than the amount spent in 1975 and 170% higher than the level reached in 1970.

- There is enormous imbalance, even in the amount of money spent on R&D by the developing countries. A few major countries account for a very large percentage of overall expenditure, e.g., Argentina, Brazil, China, India, Mexico, and South Korea. Unesco figures on R&D scientists show that, of the number estimated to be working in the developing countries, 4% are in Africa, 8% in the Arab world, 23% in Latin America and the Caribbean, and 65% in Asia. (Corresponding figures for overall developing world population distribution are 11, 7, 11, and 71%, respectively.) One should also note, however, the imbalance between developed countries where, of the 24 OECD member countries, 88% of expenditures devoted to R&D in 1984 was taking place in 5 countries.

- If the 1960s and 1970s were characterized by rapid growth in absolute expenditure on R&D in developing countries, present circumstances would seem to suggest that the rate of growth is likely to slow and that increasing attention will have to be paid by developing-country governments to the question of increasing returns to the funds invested in research.

- The R&D industry in developing countries now accounts for about \$16

billion/year and yet the broad parameters of this major activity remain largely underresearched and unknown. The equivalent figure for OECD countries is about \$245 billion (1984) — a further indication of the striking global imbalance in this area of development investment.

## Role of External Funding

Although national funding is by far the most important, it can be argued that there are compelling reasons for external agencies to provide a significant share of Official Development Assistance (ODA) to research. First, research is essentially a long-term activity. At the same time, countries that are faced, as many of the developing countries are, by urgent and pressing problems of poverty and macroeconomic imbalance, both in terms



*In 1980, expenditures on agricultural research were 170% higher than the level reached in 1970.*



of funding of public expenditure and in terms of balance of payments, must find it tempting to regard research as an expendable item in some short-term calculations.

Second, research is characterized by major externalities — most benefits of research in one part of the developing world may well accrue elsewhere and the decisions on research may well require a broad global or regional view of the opportunities and payoff for research on particular areas. Although this must be first and foremost the responsibility of national governments within a region, donor funds can also often be used to take account of these externalities. This is particularly important when a large number of countries with a population of less than 5–10 million is considered: it may be difficult to create the necessary critical mass for research on particular topics in some of these countries, even where the research problem should be given priority.

Third, research has an important requirement for foreign exchange in terms of equipment and advanced, specialized training outside the boundaries of the individual country.

Fourth, donor funding has played a major role in the development of a substantial set of multilateral research institutions in the Third World (and some in the industrial countries). This set was reviewed in the introductory section to *Searching for 1985* — it was estimated that the research budget for those institutions could be as high as \$550 million/year. They represent a growing and important new dimension to R&D in and for the Third World and account for a significant share of ODA funding to research. It is also worth noting, of course, that research carried out in the Third World is not only likely to contribute to Third World development but also, in some cases, to benefit the developed countries.

Donor funds are clearly making a major contribution to research on some

topics in particular parts of the world. For example, a recent report on agricultural research in the Southern African countries belonging to the Southern African Development Coordination Committee (SADCC) showed that more than 50% of agricultural research being undertaken in those countries was externally funded. Where external funding is accounting for such a major proportion of current research, there must be adequate safeguards to ensure that national priorities are really being followed and, at the same time, that there is adequate provision for building research capacity for the future so that activity can be continued after external assistance ceases.

## Amounts of External Aid

As an agency whose major role lies in supporting research for development in developing countries, IDRC is conscious of the value of knowing the broad contours of Third World R&D to ensure that its own activities are most effective. The improvement of input indicators on Third World R&D, however, is essentially a long-term task for national authorities, although it can obviously be assisted by outside agencies. As a first step in improving its knowledge of the environment in which it operates, IDRC determined to fund a study of support provided to Third World R&D by major funding agencies. This was undertaken by Professor John P. Lewis, and will be published later as a separate paper. A brief presentation of some of the survey's findings follows.

Professor Lewis encountered major difficulties in collecting information, by questionnaire and through visits, on a consistent and comparable basis; a considerable part of his report deals with these problems and suggests methods for donors to capture information on this set of activities more easily. As it is, there are still anomalies apparent in the data presented — probably in part because of responses of “agencies” capturing slightly

different sets of activities. It is hoped that the presentation of preliminary data will contribute to better information being available in the future.

The survey data cover eight DAC countries, the World Bank, the Asian and Inter-American Development Banks, and the United Nations Development Programme. The DAC countries covered accounted for some 82% of DAC's overall ODA in 1984 and so provide a fairly representative picture of DAC funding. According to OECD statistics, the same eight countries account for 63% of all world ODA. As a group, these eight appeared to be devoting some 4–5% of ODA resources to research for development. This overall percentage would be higher if it related only to direct flows to developing countries because, typically, some 30% of ODA is to multilateral agencies (e.g., agencies of the United Nations system and the aid branch of the European Economic Community [EEC]).

Individual countries' percentages of ODA devoted to research range from

nearly 10% (Netherlands and United Kingdom) down to 3.1% for the USA. Table 1 shows the figures for the DAC countries concerned and also provides a rough sectoral breakdown. Table 2 shows similar figures for the four multilateral agencies. The overall current annual funding to development-related research that has been covered in the present survey is \$1.9 billion. (It is worth noting at this juncture that Canada alone spends more than \$6 billion/year on R&D as of 1985, which is more than triple the total R&D support flow to the Third World.) Currently, nearly \$1.3 billion/year of external funds to R&D goes to research on rural and area development, which includes agricultural research. This compares with an estimate made for the 1976–80 period that the value of external resources for agricultural research in developing countries was running at a rate of \$407 million/year (1975 prices). It should be remembered that the figures for the World Bank are incomplete and that the survey did not cover all donors (a number of foundations, e.g., Rockefeller and Ford, play an important role in

**Table 1. Estimates of funding for development-related research from eight Development Assistance Committee (DAC) countries, 1984 (CA \$ million/year).**

Country	Rural and area development <sup>a</sup>		Technology, science, and national policy <sup>b</sup>		Human resources development <sup>c</sup>		Other		Total
Canada	102	(67) <sup>d</sup>	17	(11)	27	(18)	5	(3)	151
France	272	(60)	105	(23)	74	(16)	5	(1)	456
Federal Republic of Germany	35	(24)	56	(37)	22	(15)	39	(24)	152
Japan (1980)	70	(63)	14	(13)	27	(24)	0	—	111
Netherlands	119	(69)	38	(22)	9	(5)	6	(4)	172
Sweden	13	(32)	5	(14)	21	(52)	1	(2)	40
United Kingdom	164	(88)	16	(8)	8	(4)	0	—	188
United States	263	(79)	0	—	69	(21)	0	—	332
<b>Total</b>	1038	(65)	251	(16)	257	(16)	56	(3)	1602

<sup>a</sup>Rural and area development includes agriculture and rural development, environment and ecology, natural resources (including energy), transport and communications, and human settlements and area planning.

<sup>b</sup>Technology, science, and national policy includes engineering and technology, including adaptation and transfer; natural sciences; and industrial development and management, development planning, economic policy, and applied social sciences.

<sup>c</sup>Human resources development includes research on education and training; health and nutrition; income distribution, poverty, and employment; and population.

<sup>d</sup>Values within parentheses are percentages of total for row.



**Table 2. Estimates of funding for development-related research from multilateral agencies, 1984  
(CA \$ million/year).**

Agency	Rural and area development <sup>a</sup>		Technology, science, and national policy <sup>b</sup>		Human resources development <sup>c</sup>		Other		Total
Asian Development Bank	7	(73) <sup>d</sup>	1	(9)	0.4	(5)	1	(13)	9.4
Inter-American Development Bank	61	(64)	34	(35)	1	(1)	0	—	96
United Nations Development Programme	0.4	(45)	0.3	(33)	0.1	(11)	0.1	(11)	0.9
World Bank	212	(97)	0	—	7	(3)	0	—	219
<b>Total</b>	280.4	(86.2)	35.3	(10.9)	8.5	(2.6)	1.1	(0.3)	325.3

<sup>a, b, c, d</sup> See footnotes to Table 1.

research funding and Australia also has a centre dedicated to supporting international agricultural research). With these omissions in mind, it may not be far off the mark to estimate that the current overall volume of aid to development-related research defined along lines comparable to the average usage of respondents to the survey is in the range of \$2.1–2.2 billion/year.

Although data were requested for 1970, 1975, 1980, and 1984, it was extremely difficult to establish time series for the countries and agencies responding to the survey. For four countries where data were reported for both 1975/76 and 1984, there was a clear upward trend as a percentage of total ODA. In three out of the four cases, the percentage of ODA going to research had more than doubled in the period. This fact adds support to the generally held view that most donors, over this period, have been giving greater assistance to research and that the World Bank has been giving an increasing number of loans to research. When the World Bank reports in its annual report on loans to borrowers by major purpose, it refers to agricultural research (research does not figure as a separate category in sectors other than agriculture and rural development). In 1982–85, loans to agricultural research and extension by the World Bank were 3.6% of the total loans to agriculture and rural development — 2.5% of International Bank for Reconstruction and Development (IBRD)

loans and 5.5% of International Development Association (IDA) loans. (IBRD and IDA are the two main lending arms of the World Bank.) To the extent that the IDA countries are the least wealthy, this would seem to go counter to the observation made elsewhere that the emphasis on poverty eradication in some aid programs has reduced the percentage of donor funds going to research.

The donors have given strong sectoral priority to research bearing on rural and area development, as can be seen from the tables. During the past 10 years or so, the allocations in this direction have claimed over half their research-supporting budgets, and the inclusion of the World Bank, at least on the basis of the data available here, only intensifies this emphasis. As between the second and third categories — technology, science, and national policy on the one hand and human resources development on the other — there has been something approaching parity, but with a tilt lately toward the former. The more interesting point that can be seen from these figures may be the extent to which particular agencies specialize in one or other of these two directions. Where data are available on sectoral preferences over time, it appears that, although all agencies have sustained a principal emphasis on rural and area development, for most of them, the technology and policy sector has been accounting for a growing proportion of

funding, whereas their inputs to human resources development have been declining relatively.

Within the broad categories for which information is shown in the tables, there are major concentrations worth noting. Within *rural and area development*, annual support to research on agricultural and rural development accounted for \$1.1 billion or about 85% of total funding. The other topic attracting major research support was energy, which accounted for most of the outlays on the natural resources subsector. Energy research funding picked up after the first energy price shock in 1973/74. By 1984, for the 10 respondents where data are available from the survey, it accounted for \$144 million or 11% of their *total* support to research.

Donors have been giving the other components of rural- and area-development research a light touch. Outlays on environmentally related research jumped in the latest reported year, but only to \$5 million/year. Transport-related research claimed \$3 million in 1970 (on the part of a smaller set of respondents) and less since. Relatively little appears to have been spent on studies of human settlements and related matters.

For the 11 respondents with data available on *technology, science, and national policy*, investment was most heavy in engineering and technology research and in research on industrial development. The former appears to have been on a rising trend, the latter on a declining one, but between them they claimed about three-quarters of the category's research budget in each of the last three benchmark years.

As to the balance of the technology, science, and national policy research budget, work on management, development planning, economic policy, and applied social sciences has attracted greater funding than work in the natural sciences. But both have received good support and obviously some of the

activities classified under "technology" have a good deal of natural-science content.

Of the four subcategories into which the survey divided funding of research on *human resources development*, education/training and health/nutrition claimed at least 80% of external support in the last three benchmark years. Work on education and training received two-thirds of this assistance, but the figures suggest that the receipts of the two subcategories are converging. In the way the data were collected, research into the subjects of income distribution, poverty, and employment seems to have been comparatively neglected, although they are shown as picking up some latter-day strength (oddly enough *after* donors' antipoverty and basic-needs efforts of the 1970s had peaked). As Professor Lewis points out, this is somewhat accidental and misleading. One knows, for example, from a good bit of World Bank and United States Agency for International Development (USAID) funded research into these subjects in the 1970s that the present survey misses because of the single-year nature of its information about those two respondents. Moreover, some income distribution-, poverty-, and employment-related research has been included in activities attributed to "agriculture and rural development." Nevertheless, the current investment in poverty and employment research looks rather sparse. The same, by the estimates of many, could be said of outlays on population-related research. Nevertheless, there seems to be a steady base of support for such activity.

## Aid Effectiveness

The presentation of information here has emphasized the supply of resources to the research process, predominantly that provided by external funding to developing countries. The information on developing-country national investment in research is available in less detailed form;



the aggregate figures might lead one to think 10% of developing-country research activity is being externally funded.

A natural and compelling counterpart to the consideration of the input of resources to the research process is to examine the outcome or products of this research. This is an issue that clearly requires and deserves more space than will be devoted to it here, but the examination of input data would not be complete without acknowledgment of some major issues on the output side. In the case of IDRC, some investigation of these issues has been presented at greater length in a study published in 1986 (*With Our Own Hands: Research for Third World Development; Canada's Contribution through the International Development Research Centre 1970-1985* [IDRC-246e]).

The general question of aid effectiveness is a major area of inquiry at present. Its debate has been influenced by the Cassen report on aid effectiveness commissioned by the International

Monetary Fund (IMF)/IBRD Task Force on Concessional Flows, recently published as a book, which has generated a number of studies, particularly in the last 2 years. To the extent that the Cassen report and the debate in general caution against trying to suggest that one can know the *precise* degree of the effectiveness of aid, they have lessons for the research area as well.

The overall supply of funds to development research has two major objectives: problem solving and capacity building. In other words, funding to research seeks to contribute to the process of finding solutions to urgent development problems, solutions that need to be available as soon as possible. It seeks also to contribute to building indigenous problem-solving capacity in the developing countries. Donors, as shown in their replies to the Lewis study, exhibit sharp differences on the weight they attach to the different functions. One donor says the purpose is to find solutions to development problems, as quickly and satisfactorily as possible — *who* does the



*Most donors prefer to put emphasis on research-capacity building.*

problem solving and *how* are secondary issues. Another donor insists its purpose is to build problem solving, i.e., research capacity, in the recipient country. A third says capacity building is the real objective; however, the best way to build capacity is to help the recipient learn by doing. It is this third way that is closest to the approach adopted by IDRC. Other donors choosing the same way, however, have put greater emphasis than IDRC on the provision of outside expertise to work with developing-country researchers. Professor Lewis has concluded that it is the latter two ways — those referring to research-capacity building — that most donors prefer.

This difference in donor practice illustrates one opportunity for working toward greater effectiveness in the use of donors' resources: consideration by the donors as a group of their present and future funding intentions with respect to sectors and practices. Some mechanisms exist already to ensure donor coordination in support of research, for example, informal meetings of donors to energy research and the Special Program for African Agricultural Research. There is also the basis for a more systematic exchange of information between donors — the Inter-agency Development Research Information System (IDRIS) was created jointly by a number of publicly funded agencies that have supporting research as a major part of their mandate and it is managed by IDRC. Other agencies have also expressed interest in the data base and are potential contributors.

The major consideration of effectiveness of aid to research, however, will depend on the general view of how well, overall, research is serving the process of development. Research can be treated as an economic activity; it requires scarce resources and it provides

something of value, but it is the value of the new knowledge that is difficult to determine, even when one can show it is being used. In the productive sectors, particularly in agriculture, where research feeds into the process of production of a commodity that has a market value, studies of the rates of return to investment in research have been undertaken. The calculations involved are not without their complications and controversy; nevertheless, an increasing number of studies on the rate of return to investment on agricultural research in developing countries show high rates of return to the investments made. Indeed, they can be used to show that there has been marked underinvestment in this area, the marginal rate of return from investment to agricultural research being higher than that on many other development investments.

For some areas of research, however, the economic argument is not possible in such precise terms as a rate of return. In *With Our Own Hands*, IDRC has sought to show that research for development is making a difference to the way people live and work in the developing countries. The publication reports on a number of cases where IDRC had some role in supporting the research, but where the essential work of carrying out research and following it through to the point of its being beneficially used involved a multitude of agents and actors. Much research must be judged on this "micro-level" rather than in the "macro" aggregate calculations of rates of return.

It is these small pieces of the action that together make a difference and contribute to the well-being — or better-being — of developing-country populations. Several of these activities supported by IDRC are reported on in the subsequent sections of *Searching*.



# IDRC IN 1986

## Serving Third World Innovators

Too many pictures show the people of the developing countries in passive roles — children holding out their hands, refugees hoping for a new life, starving people begging for food. One could easily be led to think that millions have resigned from life and are leaving it to outsiders to solve their problems.

The first part of this 1986 edition of *Searching* should help lay to rest this stereotype of a Third World that relies on other people to feed it and think for it.

Although a large part of international aid does go to emergency relief, technology transfer, and technical assistance, an increasing portion is spent on original solutions to problems, many of them long term. Money given to support research tends, more and more, to go to institutions and scientists in the developing countries themselves, many of whom have already made important breakthroughs.

Two of the most heavily populated countries in the world, China and India, are now grain exporters. This is mainly because of the contributions made by Chinese and Indian researchers to the Green Revolution. Plant diseases and crop pests keep changing with the result that the sustained growth of agricultural production in several Asian countries has to be based on national agricultural research infrastructures. Most of the developing countries are gaining control of their food production. Indeed, in 1986, the traditional major grain exporters found it difficult to sell what they produced.

Scientists in the developing countries are beginning to make a name for themselves in a number of other areas such as sanitation, contraception, economics, education, and the treatment

and processing of food. The following pages give numerous examples of results from Africa, Asia, Latin America, and the Caribbean.

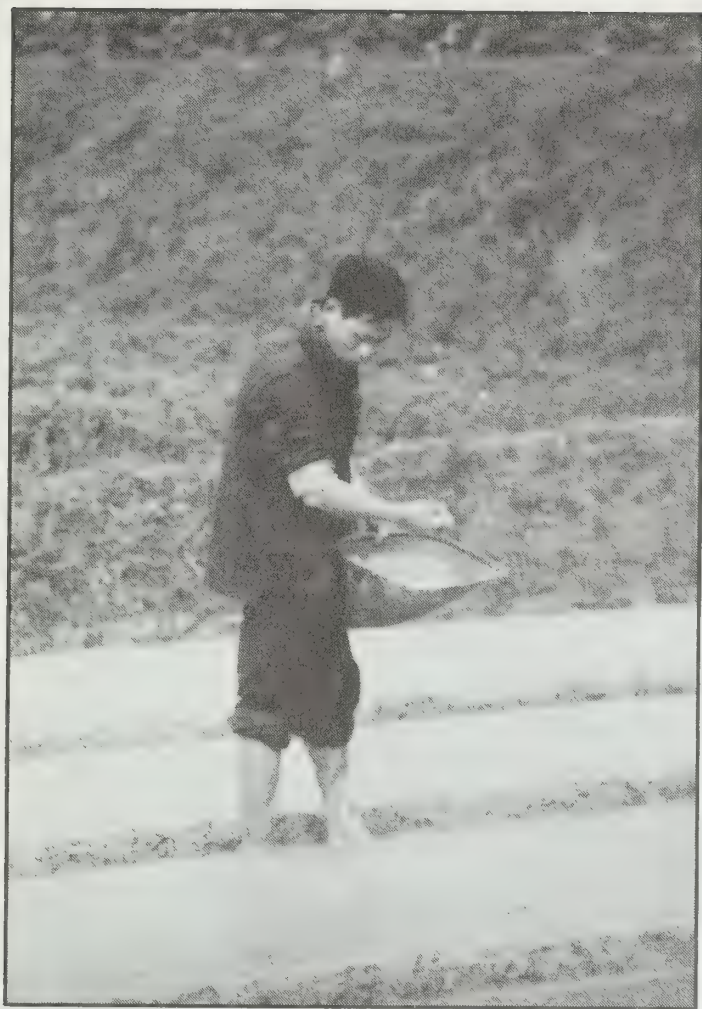
IDRC's greatest contribution lies in its being the first international aid organization to make a systematic investment in the brain power of the Third World. What follows is not only a description of the innovative efforts supported by IDRC but also a demonstration of the intellectual energy of the inhabitants of the less-favoured parts of the world.

IDRC gives preference to projects conceived and executed by Third World scientists to increase the likelihood that the results will be of real benefit to the people of the developing countries. In the past 16 years, the Centre has approved the funding of almost 2900 such proposals. In doing this, IDRC constantly tries to support those scientific efforts most likely to improve the lives of the people that science and technology have forgotten.

In the area of agriculture, IDRC has championed "on-farm research" (done in collaboration with the peasants) and research on production systems for small-scale farmers. In the social sciences, there have been many action research and participatory research projects in which the people themselves are equal partners with the researchers. The Centre has constantly looked for ways to ensure that the research it funds meets basic needs: food, water, health, housing, and education.

## Research for Life

In 1986, the Health Sciences Division made an innovative contribution



*Improved varieties have contributed to make China and India net exporters of cereals in 1986.*

to the attempt to link science to the actual improvement of the quality of life. Following its new strategy, the Division has taken steps to have communities establish their own priorities for research projects. Instead of being the passive recipients of research efforts by outside specialists, the people become the researchers' partners. A whole series of projects deliberately aimed at inventing new research methods has been proposed, all of them should make the projects supported by the Division even more responsive to genuine health needs.

Research on community health services, traditional healers, and health workers will not only provide information about their coverage and effectiveness, but will also attempt to show how a good relationship between the local population and health professionals can be achieved. The aim of the research supported by the

Division will be to improve health services or improve the state of people's health directly.

The World Health Organization (WHO) set the year 2000 as the date by which "health for all" must be achieved. As that deadline approaches, the debate over medical program priorities intensifies. In Africa, for example, the strategy of providing primary health care is faltering. Some suggest that what few resources exist should be concentrated on water supplies, whereas others think the priority should be educating and mobilizing the people. Still others suggest that vaccines are the answer. Several of the projects the Division has funded are at the heart of this debate.

### **Mothers and Health**

After a rapid fall in the 1950s and 1960s, infant mortality rates have stabilized in many developing countries at an unacceptably high level. A good many specialists no longer believe that technology alone can solve the problem. They believe that the main causes of high infant mortality are poverty and the parents', especially the mother's, lack of knowledge.

The argument over how significant a role technology plays is crucial to the improvement of health in the developing countries. After all, of what use are new vaccines if unsanitary housing and human ignorance result in pneumonia and diarrhea killing children who have been vaccinated against measles and whooping cough?

In Peru, one of the poorest countries in Latin America, IDRC's Health Sciences and Social Sciences divisions have jointly supported a multidisciplinary team at the Instituto Andino de Estudios en Población y Desarrollo in Lima. It is attempting to determine what socioeconomic factors are linked to the incidence of diarrhea, malnutrition, and respiratory diseases. The importance of research of this kind becomes readily apparent if one realizes that countries with the same technology



have greatly differing infant mortality rates.

Along the same lines, the Health Sciences Division has decided to support research by three nongovernmental organizations (NGOs) in Argentina, Chile, and Uruguay. They will examine the strategies used by poor families whose children are healthier than average. The hypothesis is that it is the mothers who are mainly responsible for this difference. According to the researchers, well-informed and motivated mothers, have a decisive impact on the infant mortality rate. They hope that if they base health programs on educating mothers, there can be rapid results without having to wait for the general standard of living to improve.

### **The Temptation of Vaccination**

The attractiveness of vaccines is still, however, undeniable. Vaccination wiped out smallpox and keeps a host of other diseases at bay. The year 1986 stands as a turning point in the development of new vaccines against tropical diseases. The first vaccine against malaria, a parasitic

disease, has been tested on human beings. Research aimed at developing vaccines to combat other parasitic diseases has begun to break new ground. These diseases include leishmaniasis, which attacks the skin or internal organs, and schistosomiasis, which mainly affects the liver. Also, an experimental vaccine against leprosy has produced encouraging results.

WHO supports most of the research into these diseases, and the IDRC's Health Sciences Division has responded by increasing its support for WHO's research program on tropical diseases. This large-scale program unites specialists from around the world in the fight against filariases (parasitic diseases brought on by worms small enough to circulate in the blood) and trypanosomiasis (sleeping sickness), as well as the four diseases previously mentioned. The Division's program officers, however, have also allocated a substantial portion of the grants to Third World institutions. In 1983–84, half the research work supported by the program was done in developing countries. A number of institutions were

### **Health in the Long Houses**

Just to get a few handfuls of salt, the people of the interior of Sarawak, the northern part of Borneo that forms part of Malaysia, have been reported to hand over priceless handicrafts to unscrupulous traders. Even today their contacts with "civilization" are not devoid of nastiness.

Ten or so years ago the nomadic hunter-gatherers of the Penan tribe began to adopt a more sedentary lifestyle. One of the less-fortunate consequences of this change was their introduction to bedbugs and cockroaches. In an action-research project conducted by the Department of Social and Preventive Medicine of the University of Malaya, these villagers had to face up to the fact that 45% had obvious goitres, 33% of their children had rickets, and 50% had scabies.

In the course of the research, a primary health-care system was put in place in eight of the most important villages. All of the families in each village live under the same roof in a traditional dwelling known as a "long house." In each of these, a man and a woman were designated as health agents.

As the result of their efforts, the number of children vaccinated tripled. Residents of five of the long houses built latrines and cleaned up the living space. Residents of six have even begun to grow vegetables, an important step for former nomads learning about agriculture.

At last the Penan have begun to enjoy some of the health benefits of civilization.

### Equipping Primary Health Services

The cost of supplies and equipment for clinics and hospitals is a heavy burden on the budgets of the poorer countries. One way of cutting the cost is to give priority to preventive medicine by training primary health-care workers based in communities. Even so, these nurses, midwives, and health-care volunteers need a certain amount of equipment. Over the years, the Health Sciences Division has financed a number of organizations — in Colombia, Kenya, and elsewhere — that have invented low-cost instruments that can be easily used by health workers in developing countries.

IDRC and WHO have supported the work of the Program for Appropriate Technology in Health (PATH), an NGO based in Seattle, USA, which has developed several instruments for the care of mothers and newborns. Recently, PATH designed an electronic, low-cost baby scale with no moving parts. It greatly decreases the risk of incorrectly weighing infants. Studies have shown that health workers often make mistakes using the baby scales currently available because of the lack of proper training in their use.

This nonprofit organization has also invented capsules that change colour after being in boiling water for a set time ranging from 6 to 20 minutes. These reusable, unbreakable "time capsules" make it much easier to sterilize drinking water or medical instruments. Finally, PATH has also succeeded in making a soluble pill from oral rehydration salts and is now developing extremely inexpensive indicators of protein in urine. The presence of protein can be a sign of albuminuria in pregnant women, of schistosomiasis, or of urinary or renal infections. Several such public health instruments were designed to be manufactured locally and contacts have already been made with firms in the Third World.

also directly supported by IDRC to conduct research into malaria, filariases, leishmaniasis, and dengue fever (a viral disease transmitted by mosquitoes).

Less attention has been paid to leishmaniasis than to the other parasitic diseases. In Colombia, Mexico, and Peru, however, researchers have been studying the incidence of its various forms. In the first phase of a project conducted by a team from the International Centre of Cooperative Medical Research (CIDEIM) in Cali, Colombia, it was demonstrated that the likelihood of infection is determined not only by work in the forests, as was hitherto supposed, but also by the season, the victim's age, and his or her housing. The Peruvian team will have the support of a specialist from the University of British Columbia, Vancouver, Canada, in a cooperative project. (Cooperative projects require collaboration between at least one Canadian institution and one

developing-country institution, see the section on The Contribution of Canadian Researchers.)

Among the numerous efforts aimed at helping developing countries to become more active in the scientific and technological struggle against disease, the research done by the Instituto de Medicina Tropical "Pedro Kouri," Havana, Cuba, is of particular interest. Until recently, the hemorrhagic form of dengue fever (DHF) had never been seen outside Southeast Asia, but in 1981 there was an outbreak of it in Cuba. In a 6-month period there were 10 000 reported cases and 158 deaths. The Institute showed that the virus, transmitted by mosquitoes, was particularly likely to strike women and people with asthma or diabetes. Given the danger that the disease now poses, the Health Sciences Division is supporting research in Honduras and Mexico where there have also been some deaths caused by DHF.



## New Diseases

The developing countries must contend with not only "old" diseases but also completely modern ones, such as those related to industrialization. Since 1980, women have made up more than 37% of the work force in South Korea. Even if they work longer hours than men, their wages are still much lower. There have already been investigations into their working conditions, but only on a small scale. Now the Catholic Medical College of Seoul, which in the past has received IDRC support for studies on coal miners and the workers of small- and medium-size enterprises, is going to undertake an in-depth study of 3000 women workers in the textile, shoemaking, rubber, and electronics industries.

Although Egypt isn't industrializing as rapidly as Korea, it is estimated that the small- and medium-size enterprises in the Nile Delta employ a work force of 540 000. A team from the University of Alexandria will draw up a scientific profile of the most frequent kinds of work accidents. In the Egyptian capital, Cairo, a number of enterprises have begun manufacturing pesticides, but their managers know almost nothing about the dangers involved. Specialists from the University of Cairo School of Medicine will inspect 10 of these firms to find out more about what is going on and to propose preventive programs for workers and employers.

It seems that even the relatively less-toxic synthetic pyrethroid insecticides (which are rather harmless to warm-blooded animals, including human beings, but very poisonous to cold-blooded animals, including insects) can be dangerous in certain situations. The Chinese Academy of Preventive Medicine in Beijing has asked IDRC to fund research into numerous poisonings that have occurred since 1980 when synthetic pyrethroids were introduced on a large scale in China. In 1982, 300 cases of pyrethroid poisoning were reported

among cotton growers. The Chinese researchers want to identify the precise reasons for this situation, which seems to be unique to their country.

## Action Research on Water

Diarrhea affects millions of people throughout the developing world. Some 750 million children under the age of 5 suffer from it each year in Africa, Latin America, and Asia. The figures for China, however, have only recently been made public outside the country. In 1983, there were almost 5 million reported cases of dysentery in this country of more than 1 billion people. The epidemics seem to be seasonal and the Ho-fei Medical College in An-hui Province hopes to determine what bacteria and viruses are involved.

A significant part of the Health Sciences Division's budget is spent on helping communities to clean up their environment. Here again it has joined the Social Sciences Division to fund a major action-research project directed by a scientist from the American University in Cairo. In this project, Egyptian academics will be the catalysts in helping village people, particularly women, to identify the sources of pollution and suggest solutions.

## UNIMADE Pumps

If there is to be potable water available to 2 billion people by the year 2000, it will have to come from below the ground. In Cameroon, Costa Rica, and India, the Division will finance projects for the introduction of a polyvinyl chloride (PVC) pump that was developed in several previous projects.

The first model of this pump originated in Canada at the University of Waterloo. Teams in Africa and Asia then adapted it to their needs and local technological capabilities. Now the model that was perfected and mass produced in Malaysia, known as the UNIMADE, is enjoying great success. The three new grants will enable researchers to evaluate the potential of these plastic pumps in other countries and, for the first time, on

the American continent. IDRC water specialists expect that Costa Rica will become the centre for the dissemination of this technology throughout Latin America.

A project undertaken by the Ministry of Science and Technology of the Indian State of Rajasthan clearly shows the benefits of the plastic pump. There are already 50 000 water pumps in Rajasthan, but they are made of metal and corrode, giving the water a bad taste. Indian specialists, therefore, have decided to conduct a plastic pump trial. The UNIMADE pump is an especially attractive option because it can be maintained by the villagers.

### **Putting Research Results to Work**

Each year more and more projects reach completion. For IDRC it becomes

increasingly crucial to make sure that the research results are put to the fullest possible use. The skills and resources of the Communications Division are available to researchers who have produced results and want to disseminate them. The Division funds a few projects on its own but, more and more, is working directly with the Centre's program divisions. In 1986, for example, the Communications and Health Sciences divisions collaborated on two experiments in the dissemination of research results.

In the first of these, Yayasan Kusuma Buana, an Indonesian NGO, will produce 26 radio dialogues on the care of mothers and infants. They are designed to popularize the results of research by four Indonesian teams that were supported by the Health Sciences Division to conduct studies of contraceptive practices, breast feeding, and the use of oral rehydration among the poor. The dialogues will be pretested and modified in response to the comments received. Once they have been initially broadcast — Kayu Manis, one of the most important radio stations in the Jakarta area, has expressed an interest — the programs will be offered to the 300 stations scattered over Indonesia, the largest archipelago in the world.

Again in Southeast Asia, but this time in the extreme northwest of Malaysia, the Communications Division has helped to alert the public to the threat from fecal matter. The project is an experiment done by the Consumers' Association of Penang, one of the most active and effective NGOs in the whole of Asia. They will disseminate leaflets written in simple, colloquial language describing the results of research into conditions in five villages. It is hoped that this will encourage communities to launch full-scale cleanup campaigns. Later on, the strategy developed will be offered to other NGOs in Asia that are involved in efforts to improve the health environment.

Most couples in the industrialized countries plan how many children they



*The UNIMADE plastic pump can be maintained by villagers.*



want and when. This option ought to be available to Third World families too, but the cost of contraceptive methods must first come down. Since 1975, IDRC has supported research in India on a contraceptive vaccine. The work is now at an advanced stage. Indeed, in 1986, the National Institute of Immunology of New Delhi began tests on women in the United States and India. IDRC's support for the Indian researchers played a crucial role in enabling them to apply the most advanced endocrinology, immunology, and genetic engineering research techniques.

IDRC's Health Sciences Division has dozens of scientists as its partners — whether they are working on better water pumps, developing new vaccines, or investigating community health mechanisms jointly with the end users. The foregoing paragraphs mention only a few of the investigations the Division is currently supporting and provide only a brief glimpse of what is being done by the developing countries in medical and health research.

## **The Contribution of Canadian Researchers**

The large majority of research projects financed by IDRC is designed and carried out by Third World scientists. They take charge of all phases of the research, from the original proposal to the final report, from the field studies to the management of the funds. IDRC is convinced that the best way to strengthen the scientific and technological potential of the Third World is to give its researchers opportunities to gain more experience.

There is, however, a great deal of knowledge available in the industrialized world that could be useful to the developing countries. For this reason, IDRC established, in 1981, its Cooperative Programs Division. Each of the Division's projects is jointly executed by at least one Canadian institution and

one developing-country institution. The original proposal must come from a Third World institution that is seeking a Canadian partner.

The budget granted by the Government of Canada specifically for cooperative programs is divided into two roughly equal parts. One part is managed by IDRC's other divisions; the other is entirely controlled by the Cooperative Programs Division. These latter funds are used for projects in areas not usually covered by the Centre's other divisions. The Cooperative Programs Division currently has two programs: earth sciences and technology for local enterprises.

The Division's program officers are not simply trying to transfer Canadian technology to the Third World, their purpose is to finance genuine research projects in which Canadian and foreign partners jointly develop something new. What IDRC hopes to encourage is the transfer of knowledge, not the export of technological panaceas.

### **Saltwater Intrusion**

In West Africa, as on other continents, many cities draw much of their water from the subsoil. Whenever the citizens of Dakar, the capital of Senegal, worry about their potable water supply, they are thinking of the aqueduct that brings water from Lake Guiers, 250 km north of the city. The truth is, however, that 83% of the water requirements of the Dakar region are met by drill holes and wells that tap six aquifers under Dakar and its neighbouring areas. About a third of the water comes from two aquifers right at the tip of the peninsula on which the city is built. That means that seawater is never very far away. If too much water is taken from the aquifers, there is a risk of intrusion by salt water and irremediable pollution of the water source. In the Geology Department at Laval University in Québec, engineers have developed a computerized model that will be applied to the aquifers, both of which have already been studied by

specialists at the Geology Department of the University of Dakar. The two universities will collaborate in the creation of computerized models for predicting the saline intrusion associated with various methods of water extraction.

Populations that depend on underground aquifers for their water need to be sure that such sources will be constantly recharged. What worries the hydrologists in the little kingdom of Swaziland, which has 600 000 people, is that deforestation favours a kind of erosion that interferes with the recharging of groundwater sources. The Ministry of Natural Resources has counted 2500 ravines, known as "dongas," some of them 10-m deep, which speed up runoff preventing the water from penetrating the soil. The Ministry's specialists will have the help of a Canadian company, Water Management Services of Fredericton, New Brunswick, in finding ways to prevent the formation of more dongas.

### **Domestic Fertilizers**

The Cooperative Programs Division finances a large number of projects in which Canadian experts join their counterparts in Third World countries to develop mineral resources. Various projects are aimed at exploiting deposits of fertilizer-rich minerals without having to build expensive processing plants.

Burundi is located in the heart of Africa. It is a small, overpopulated country of 5 million people. It spends \$2 million to import fertilizers every year. Recently, a substantial deposit of phosphates was discovered 70 km northeast of the capital, Bujumbura. Even allowing for export to neighbouring countries, it cannot be assumed that a typical phosphate fertilizer plant could be profitable. Part of the reason is that there is no local source of sulphuric acid, a chemical that is needed to process natural phosphates (in this case, mostly apatite) into soluble phosphates.

Scientists in Burundi, with the help of their opposite numbers in Zambia and at Agriculture Canada, will try to develop an

artisanal process for the manufacture of fertilizers. They will replace the traditional method of sulphuric acid-based acidulation by partial acidulation in which the apatite is composted with dung, peat, or wastes from the harvest, wood, or slaughterhouses. Peasants in Burundi are already making compost using agricultural waste, and the country has enormous quantities of peat. If the results of the experiment are conclusive, in 3 years, the peasants of Burundi will be making their own phosphate fertilizers using their own resources.

### **Using Kilimanjaro to Build**

The cost of building materials in Tanzania severely limits the access of underprivileged groups to decent housing. Sometimes, however, simply making the best use of what's available can solve the problem. Beneath the northeast slope of majestic Mount Kilimanjaro are 352 million t of building stone, the equivalent of 9 billion  $15 \times 25 \times 50$  cm blocks — quite enough to provide housing for the 500 000 inhabitants of the districts near Moshi and Rambo, which are among the most heavily populated in Tanzania. Using artisanal methods, about 150 miners are quarrying the stone, which is five times cheaper than cement blocks. They can't meet the demand, however; some weeks they don't even have enough dynamite and their output drops to 1500 linear metres of  $15 \times 25$  cm bricks. The Prairie Masonry Research Institute of Canada in Edmonton, Alberta, and the Agricola Mineralia Company in Navan, Ontario, will collaborate with the engineers of the Tanzanian Ministry of Energy and Minerals to improve stonecutting techniques, build a number of prototype houses, and write a construction code for building in stone.

The 22 000 tin and tungsten miners in Thailand also work artisanally, using pickaxes and shovels in about 367 small open mines. Although tin has not escaped the general fall in raw materials prices, these small operations have suffered less than the largest Thai mining companies



because their operating costs are low. Thailand probably still has many small undiscovered veins of ore, too small for the large companies but large enough to be mined artisanally. So far, the discovery of ore veins has largely been a matter of luck. The Department of Mineral Resources in Bangkok has asked for IDRC support to work with the Institut de recherche en exploration minérale of Montréal, Quebec, to develop geochemical prospecting technology specifically adapted to conditions in Thailand. This technology will promote the continued operation of the artisanal mines, which employ thousands of people.

### **A Useful Bug**

The Cooperative Programs Division also receives a steadily increasing number of requests to support research aimed at meeting the needs of the small- and medium-size enterprises in developing countries. In 1986, the Division responded favourably to a number of proposals, including one from the Instituto de Investigación Tecnológica Industrial y de Normas Técnicas (ITINTEC) of Peru, which contacted the Metallurgical Engineering Department of Queen's University in Kingston, Ontario.

Metallurgists at the two institutions will tackle the problem of poor-quality brass (copper, zinc, and tin alloy) and bronze (copper and tin alloy) castings. Almost half the castings have to be melted down again and recast. Sand grains in the moulds and air bubbles greatly reduce the market share that alloys from the roughly 200 small foundries in Peru ought to be able to command. By sharing their latest discoveries with ITINTEC's researchers, the Canadian scientists will reinvigorate metallurgical research in this important mining country. Despite its mineral wealth, Peru currently imports \$2 million worth of copper alloys every year.

In another joint project with ITINTEC, chemists at Simon Fraser University in British Columbia will study methods of extracting carmine from the cochineal

insect *Dactylopius coccus*, which is a parasite found on cactus. Carmine is a bright red colorant used in dyeing, confectionery, and perfume manufacture. Because it is a natural colorant, strong demand has pushed the price of carmine to US \$460/kg. Peru, unfortunately, mainly exports uncrushed cochineal insects (80% of world production) at the much lower price of US \$35/kg. The researchers will try to develop efficient, small-scale extraction methods. If they are successful, a larger part of the industry's income will go to the 50 000 people who raise cochineal insects in the huge cactus fields of the arid regions of the Peruvian Andes. The Cooperative Programs Division is attempting to do something similar in India by making technology available to small- and medium-size enterprises for the extraction of sebacic acid from seeds of the castor-oil plant. Sebacic acid serves as a plasticizer for food wrappers.

### **Competitive Textiles**

In many countries, small- and medium-size enterprises are particularly drawn to the textile industry. Industry activities range from family weaving to ultramodern, computer-controlled machines and constitute a microcosm of the history of technology. Innovations in weaving technology have an enormous impact because the industry is so wide spread and employs so many people. Now that the industrialized countries are robotizing the industry as rapidly as they can, the developing countries are confronted by the challenge of maintaining and developing a competitive, modern textile industry without losing too many jobs.

In Pakistan, 100 000 artisanal weavers work about 150 000 mechanical looms, most of which are locally made. Such looms produce a limited range of patterns and, in the long run, this is a threat to the attractiveness of Pakistan's textiles. The Pakistan Council of Scientific and Industrial Research in Karachi has asked for the technical support of the





*Developing countries must modernize their textile industry without eliminating jobs.*

Industrial Technology Centre of Winnipeg, Manitoba, to test a low-cost mechanical device to increase the number of patterns that can be produced. IDRC has agreed to finance this research. More than any other cooperative project, this joint effort by Pakistani and Canadian researchers displays IDRC's firm intention of promoting constructive scientific cooperation with the less-privileged nations of the Third World.

### **Keeping Scientists in Touch**

Scientists need information just as much as they need grants. If they lack information, their efforts may be wasted because someone else somewhere else has already done the same experiments. Unless confirmed by other researchers, their discoveries are nothing more than opinions. Also, interaction between scientists is often highly productive; many important scientific contributions

have come from the synergy of several researchers.

From the beginning, IDRC recognized the importance of information and established an Information Sciences Division. Over the years, the Division has made a contribution of capital importance by setting up international scientific information systems designed to serve first and foremost those researchers working for the benefit of the Third World. The Division has also given its support to a large number of documentation centres and libraries. IDRC support has also enabled national information systems to link up with major international networks, particularly in agriculture.

#### **The Agricultural Bibliography Club**

In West Africa, the Information Sciences Division has undertaken to help two more countries link up with the International Information System for Agricultural Sciences Technology (AGRIS).



The Division's contribution will help to reinforce the infrastructures of the Centre national de documentation agricole, in Burkina Faso, and the Centre de documentation in Senegal's ministry of rural development. These centres will be better equipped to collect national agricultural documents, catalogue them, and publish bibliographies. Although the information will be aimed at local users — decision-makers, agricultural engineers, teachers, and students — it will also be available worldwide through AGRIS, a network that offers access to the agricultural bibliographies of 116 member states. When a state joins, it is required to make its national bibliography available.

### **AGRIS Welcomes China**

When the only country in the world with more than 1 billion people, 90% of whom are involved in agriculture, decides to join the AGRIS network, there is the threat of a major documentation bottleneck. On the one hand, there is AGRIS, which lists more than a million documents; on the other hand, China has thousands of documents all written in Chinese characters.

The Chinese authorities have decided to translate 65% of their agriculture-related bibliographic documentation into English before entering it in AGRIS. A grant from the Information Sciences Division will contribute to the translation of 80 000 AGRIS bibliographical records into Chinese and of 8000 from Chinese into English. Several Asian countries, including Malaysia, the Philippines, Singapore, and Thailand, have already been linked with AGRIS through IDRC support and have been waiting for a long time for access to Chinese agricultural research.

The essential tool in this project is MINISIS, a bibliographic software package developed by IDRC. This exceptional program, used by some 170 institutions worldwide, can operate in several languages at the same time. A unilingual Chinese would be able to find documents

entered in the system in English only. The system will be the seventh MINISIS installation in China.

### **Information on Animals**

It sometimes happens that the documents of an entire library disappear or become inaccessible because of wars or political upheavals. There are several cases in Africa where countries have had to recover the main elements of their national collection from other countries. In 1976, the International Livestock Centre for Africa (ILCA) in Addis Ababa, Ethiopia, began systematically collecting animal research documents from 21 African countries, thus avoiding such problems. Since that time, the Information Sciences Division has supported the collection that now numbers more than 20 000 documents. In 1986, it undertook to continue its financial support for another 3 years.

Other agriculture-related activities supported by the Division include two information services at the International Center for Agricultural Research in the Dry Areas (ICARDA) in Aleppo, Syria, which deal with beans (*Vicia faba*) and lentils. In regard to information on lentils, ICARDA will collaborate with the Crop Development Centre at the University of Saskatchewan, which houses the second most important group of lentil specialists after ICARDA. (Canada is the world's second largest lentil exporter.) A bulletin will be published on each of these legumes and will contain articles in both Arabic and English. In the Middle East, there has been intensive research into beans and lentils because they contribute much of the protein in the diet of the underprivileged.

### **Talking Technology**

In Southeast Asia, the Information Sciences Division has successfully supported an important technical and industrial extension network called TECHNUNET. The African countries have entrusted this mission of promoting appropriate technology to the Centre

régional africain de technologie (CRAT) in Dakar. The Division has agreed to support the development of CRAT's documentation centre by equipping it with a microcomputer and contributing to the training of personnel to run a question-and-answer service. CRAT will also be able to continue publishing its bulletin and newsletter. Specialists will evaluate the usefulness of on-line access to data bases at the Centre in Dakar.

The Information Sciences and Social Sciences divisions of IDRC have also joined with other donors in Sweden and the United States in supporting the Council for the Development of Economic and Social Research in Africa (CODESRIA) in Dakar. CODESRIA funds research in the social sciences throughout Africa and has contributed to the establishment of social sciences research centres in Southern and East Africa. For about 10 years, CODESRIA has regularly published the quarterly *Africa Development*, in which articles appear in their original language: English or French. From now on, there will be a separate publication for each language and articles will be available simultaneously in both languages. It is expected that there will be a considerable expansion of CODESRIA's research activities and its influence in Africa.

### Marketing

To date, the Information Sciences Division's grants have been aimed primarily at promoting the exchange of information between scientists. In the future, some of the projects will be directed toward other kinds of users.

In Trinidad and Tobago, the Association for Caribbean Transformation (ACT) has inaugurated an information service on the market prices of 40 agricultural products. The aim of the project is to inform the 40 000 farmers of Antigua, Dominica, and Trinidad and Tobago of the prices they should get and the potential markets for their products.

ACT bulletins, published quarterly in Antigua and monthly in the other

countries, record price fluctuations and indicate market trends for the coming 2 months. By clearly describing the situation in each island, these bulletins provide small-scale farmers with extremely useful information. It is, in fact, so useful that radio stations in Antigua and Dominica broadcast it.

Another project should prove extremely valuable to numerous Caribbean and Latin American countries suffering from profound socioeconomic upheaval. Several countries have seen drops in personal income and find their future mortgaged by enormous debts. It is not surprising then to see increasing interest throughout the region in the exchange of information about the various economic strategies being adopted. IDRC has undertaken to continue its support for INFOPLAN, the Latin American planning information system designed to meet the information needs of planners. Another grant will help to set up a national documentation centre to serve as the focal point for INFOPLAN on the island of Dominica in the Lesser Antilles.

The Division will also provide support for a network that provides information about investment opportunities in the Caribbean and Latin American countries. RIALIDE (Red de Información de la Asociación Latinoamericana de Instituciones Financieras de Desarrollo), based in Lima, Peru, helps small- and medium-size entrepreneurs to get in touch with potential investors, development banks, or international banks. Bimonthly or quarterly bulletins on projects in need of funds — and on funds in need of projects — are RIALIDE's contribution to the region's attempts at economic recovery.

### The Healers Speak

Cameroon is one of the few African countries that has reached self-sufficiency in food and is now giving priority to health. The strategy proposed by the government is designed to draw both on modern technology and on the skills of traditional healers. The government has,



### **Learning Research Skills**

IDRC's research grants offer a range of opportunities for on-the-job training of scientists in developing countries. Many scholarships are also awarded each year to young scientists directly or indirectly involved in projects funded by the program divisions. In 1985-86, 172 such scholarships were awarded, most of them to enable the recipients to earn Master's degrees.

IDRC's Fellowships and Awards Division also finances group training courses on the recommendation of the program divisions. Among training activities in 1986 were the following: an introduction to health services research for health personnel in Southern Africa, a course for 20 Asian researchers on postharvest economics, internships for 10 representatives of South American Indian communities on community development research methods at the Saskatchewan Indian Federated College in Regina, and courses at the Academy of International Law in the Hague for 20 young lawyers from developing countries.

Finally, IDRC's Office of the Secretary and General Counsel approved a grant for a large management-improvement project in 23 research institutes in nine countries in the Sahel. This 3-year project, jointly administered by IDRC and ISNAR, based in The Hague, includes several internships for researchers and administrators and the introduction of new management systems in a dozen research institutes. IDRC will administer the Canadian International Development Agency's (CIDA) contribution to this project.

among other things, provided the Institut de recherches médicales et d'études des plantes médicinales (IMPM) with new premises. A grant from the Health Sciences Division will help IMPM to manage and disseminate the information it gathers. Its 48 researchers annually produce about 200 publications and are among the most productive in West Africa.

Unfortunately, traditional healers are powerless to deal with poisoning caused by modern products. In Sri Lanka from 1979 to 1982, almost 80 000 people were hospitalized because of poisoning. Pesticides were involved in 65% of the cases, and it is expected that the number of cases will continue to increase. In response, the General Hospital in Colombo intends to set up a national poison information service with the help of a joint grant from the Information Sciences and the Health Sciences divisions. Information on antidotes and treatments will be available by telephone 24 hours a day. The service will also publish bulletins on how to handle the commonest forms of poisoning.

In rapidly industrializing countries such as Thailand, which now has more than 120 000 industrial firms, there has been an accompanying increase in work-related accidents. The inspectors of the National Institute for the Improvement of Working Conditions and the Environment (NICE) in Bangkok do the best they can. In 1984, they inspected more than 40 000 operations and offered advice to more than half of them. One of the priorities now is to analyze the mass of information and statistics that has been collected and to start up safety campaigns. In a cooperative project, NICE will have support from the Canadian Centre for Occupational Health and Safety in Hamilton, Ontario, in installing a data-processing system that runs on a minicomputer and MINISIS software.

### **Information on Water Supply**

During the past year, the Information Sciences Division also agreed to finance several experiments on the collection and dissemination of information on water supply and sanitation in Argentina, Burkina Faso, the Philippines, and Sri

Lanka. In the Philippines, the Division will give its support to Aprotech, a regional organization grouping 38 NGOs in eight countries. In turn, these NGOs maintain exchanges with hundreds of other NGOs, a number of which have been spectacularly successful in helping to improve rural sanitary conditions. The Aprotech network will enable them to share their successes.

### **Portable Libraries**

While information-exchange networks continue to grow, new storage methods are becoming available to users. Videodiscs and compact discs, for example, can carry an entire encyclopedia. Coupled with a microcomputer and a printer, videodiscs will make it possible to "take out" not a single book at a time but the whole library. By providing inexpensive ways to access the information on such discs, it may eventually be possible for developing countries to operate large numbers of these new-style libraries.

The Division has undertaken to support an experiment in the use of videodiscs by the Consultative Group on International Agricultural Research (CGIAR). This organization groups together, among others, the major international centres of research on rice (located in the Philippines), on sorghum and millet (India), and on corn and wheat (Mexico). About 5000 documents dealing with the most important crops in the Third World will be prepared for storage on videodisc.

Finally, a cooperative project of the Information Sciences Division links the Centre d'applications et de recherches en télédétection at Sherbrooke University, in the province of Quebec, with the Centro de Estudios Urbanos y Regionales de la Universidad Católica Madre y Maestra in the Dominican Republic. The researchers will develop a method of analyzing satellite photographs. The Dominican Republic occupies two-thirds of an island it shares with Haiti. So far, the forests of

the Dominican Republic have survived better than those in Haiti. Increasing numbers of peasants, however, are migrating into the mountainous areas and the rate of deforestation is accelerating. Using satellite photos collected over a period of years, a multidisciplinary Dominican and Canadian team will analyze the environmental impact of successive laws governing agricultural land tenure.

In this way, aerial photos will serve as a reminder of the importance of the rural poor. In numerous Third World countries, the erosion of the mountainsides is the sign of desperate settlement by families who have nowhere else to go but do not have the resources to build the structures required to control erosion. IDRC's Information Sciences Division is contributing to make space-age technology transmit the plea of neglected, marginal people to planners.

### **Research for Nourishment**

In recent years, food production in the developing world has risen twice as fast as population. The World Bank points out, however, that most of the increase comes from irrigated land, particularly in Asia. In most of Africa, agriculture is not only faltering but also destroying the environment. Very little land is irrigated, and marginal areas such as mountainsides are becoming overpopulated and overexploited by poor farmers. Even in regions where agricultural research has led to the development of highly efficient production systems, a great deal still remains to be done. Among others, for example, what can be done to ensure that the food sector acts as the engine of development by creating employment in rural areas?

The Agriculture, Food and Nutrition Sciences Division of IDRC supports research that might provide answers to such questions. The Division has also committed a good deal of its resources to



research on improving agricultural yields in the most difficult environments.

### Women Entrepreneurs

Millet and sorghum account for about one-fifth of all cereals produced in the Indian state of Andhra Pradesh. They are consumed by the poorest families whose standard of living is far below that of people who eat wheat or rice.

During previous research done with IDRC support, nutritionists at the College of Home Science of Andhra Pradesh Agricultural University (APAU) in Hyderabad carried out a number of surveys in rural households. These showed the need to liberate women from the burden of threshing and grinding grain. The APAU team then developed food products for children using millet and sorghum dehulled by a machine developed in other IDRC projects. Other products made with millet and sorghum flour, such as biscuits, bread, and pastry, were also in great demand.

This led the Division to increase considerably its support for APAU and to help them to set up a number of small mills and bakeries. The management of the pilot mills and bakeries was given to

women. The team from APAU, consisting entirely of women, expects these undertakings to create many jobs for women in poor rural areas. In the long run, it may be possible to modernize a major part of the food-processing sector and entrust it to rural women.

### Insects Versus Insects

In Africa, cassava is the preferred food of the poorest populations. It can grow in poor soil and produces a large quantity of edible roots. It serves as a kind of insurance against famine because, even when mature, the tubers can be left in the soil for almost a year without spoiling.

Teams in Uganda, Rwanda, and Zanzibar that are working to improve cassava will have help from the Nairobi Station (in Kenya) of the Commonwealth Institute of Biological Control (CIBC) in a large-scale project to fight the enemies of cassava by biological means. At the moment, a number of insects of South American origin are threatening cassava. Mites were accidentally introduced into Uganda in 1970 and a type of mealybug that attacks cassava (*Phenacoccus manihoti*) was discovered in Zaire 3 years later. Those who grow this tuber simply

### Forecasting Famine

In 1984 and 1985, refugee camps in Sudan were packed with families fleeing from the drought-devastated land. Starving and stripped of all possessions, many had lived through 8 successive years with little or no rain. Whole villages had had no harvest for 3 years.

Can something not be done before people are reduced to total desperation? Satellite pictures give information about the state of the ground cover, and physical measurements of people indicate how well nourished they are, but is there any way of picking up the tell-tale signs of famine? The hypothesis has been put forward that, by following the movement of certain specific socioeconomic indicators, it might be possible to foretell the approach of famine.

In 1986, IDRC's Information Sciences Division made a small grant to a team at the Food Emergencies Research Unit of the London School of Hygiene and Tropical Medicine to test this hypothesis in Sudan and Chad. The field research showed that successive crop failures lead to a rise in the price of cereals and forage, accompanied by a drop in cattle prices. If the drought persists, families sell their personal possessions such as jewelry and furniture; then they borrow; finally, they migrate. Then it is often too late, and many lives have been shattered. Yet all that went before was a warning of the famine to come.

can't afford to buy insecticides. That is the reason for the great interest in fighting these insects by introducing others to prey on them.

Given the enormous diversity of Africa, a whole range of predators has to be identified, each one suitable for a different ecological environment. CIBC will use IDRC funds to train teams in nine countries in East and Southern Africa in biological pest control methods.

### **Protecting China's Crops**

Chinese peasants are already using trichogramma, an insect that destroys corn and sugarcane borers by laying its eggs in their larvae. The national biological pest control program using trichogramma already covers 600 000 ha in China. Through a cooperative project, researchers at the biological pest control laboratory in Beijing will collaborate with those at Guelph University (Canada) in finding trichogramma that are effective against the enemies of other crops.

So far, the Chinese successes all derive from strictly empirical methods. Between 75 000 and 150 000 trichogramma/ha are needed to succeed with a biological control program. An understanding of the basic principles of mass breeding useful insects is needed, especially if the Chinese method is to be disseminated among farmers in other Asian countries. The international community of specialists in biological pest control, including its Canadian members, will gain a great deal from this collaborative project, which will include the production of an English translation of the Chinese manual on trichogramma.

### **Multidisciplinary Teams**

To help research teams that are trying to develop new integrated technology packages for farmers, the Agriculture, Food and Nutrition Sciences Division finances numerous projects on complete agricultural production systems or on crop or animal production systems. Several African countries are beginning to

establish the multidisciplinary teams needed for such projects.

The Department of Research and Specialist Services (DR&SS) of Zimbabwe's Ministry of Agriculture has set up a unit to undertake research on agricultural systems. The Division will help the unit to develop systems suitable for use by small-scale farmers. The Government of Zimbabwe has made a firm decision to help its small-scale farmers financially, but it wants to move constructively and carefully. Until now, on-farm research has helped large farms in Zimbabwe; now it is time to bring the benefits to small-scale farmers. The Division has also undertaken to support another project to be executed by Sokoine University of Agriculture in Tanzania, which involves close collaboration with the local farmers.

### **Animals Great and Small**

The Agriculture, Food and Nutrition Sciences Division also sets up networks of projects as a way to encourage exchanges. One of the most important created by the Division is the research network on animal production systems in Latin America. Supported for the last 8 years by the Division, it groups 13 projects whose work ranges from the improvement of pastures for dairy cattle, to the improvement of native breeds of swine, to the breeding of guinea pigs.

An important project approved in 1986 will strengthen the links between three Latin American organizations: the Inter-American Institute for Cooperation on Agriculture (IICA) and the Tropical Agricultural Research and Training Centre (CATIE), both in Costa Rica, and the Instituto Nacional de Investigaciones y Promoción Agropecuaria in Peru. In Peru, the Division will support research into alpaca breeding and guinea pigs. Guinea pigs provide meat for the people of the Andes Mountains and alpacas produce wool that can fetch \$6/kg. The Peruvian veterinary researchers will attempt to increase the fertility of these two species.



### After Pounding

In the back streets of African cities and in the villages, people take their sorghum, millet, and corn to small mills to have them ground; however, they first have to dehull them, that is, remove the exterior coating of the grain, an operation that few mills are equipped to perform. Dehulling is left to the women who do it by pounding the grain with a pestle. But things are changing in Botswana.

In this small Southern African country, 23 mills are equipped with mechanical dehullers and their customers can bring in their corn, sorghum, or millet without having to dehull it first. These mills employ more than 300 workers and most of them make sorghum flour, which used to be imported from South Africa. The main manufacturer of dehullers in Botswana, the Rural Industries Innovation Centre, based in Kanye, even exports them to South Africa and has sold some to Tanzania.

In 1986, 10 African countries and 4 countries in Asia tested a number of dehuller models. In India, the machines are to be used by several small firms that produce food for weaning infants, and all will be managed and operated entirely by women.

In Senegal and Zimbabwe, a smaller model is being tested and adapted. It too is based on a design by the National Research Council of Canada. Craftsmen in the West African country of Gambia have begun to manufacture it.

### Combating Aflatoxin

The storage of grain in the tropics poses some serious problems. Humidity and heat combine to produce mould, which, in turn, produces aflatoxin, an extremely poisonous and carcinogenic substance. The National Post-Harvest Institute for Research and Extension (NAPHIRE) in the Philippines will try to find low-cost methods for the protection of corn stocks against aflatoxin-producing mould. This research is likely to be of great value to small-scale farmers in the Philippines, who often have their grain rejected by mills because of mould.

In Zimbabwe, most of the loss of corn in silos is caused by insects. Farmers traditionally build their silos of wood, but the disappearance of the forests has made it increasingly difficult to build and maintain such storage facilities. An NGO called Environment, Development, Activities-Zimbabwe (ENDA) has already tested a new inexpensive brick silo in 11 villages. With the support of the Agriculture, Food and Nutrition Sciences Division, ENDA will perfect its silo and identify the conditions required for large-scale dissemination.

### Trees for the Heights

One-quarter of Colombia is mountainous, and the healthy environment of the highlands has always served as a magnet to the population. Above an altitude of 2800 m, however, there has never been any systematic attempt to use the land. For a long time, foresters thought nothing of value could be grown there. Specialists at the Corporación Nacional de Investigación y Fomento Forestal in Bogotá, however, persevered and believed that certain trees could be acclimatized. The Division has agreed to support them in an effort to demonstrate that strains of eucalyptus and pine could be grown on 3.5 million ha of mountain slopes never before utilized. The results of this work are of the greatest importance to millions of peasant families who eke out an existence by cultivating the steep slopes of the Andes. This project is 1 of about 10 dealing with reforestation in the Andes. To encourage exchanges between researchers, the Division will pay the salary of a specialist from the Instituto Forestal in Santiago, Chile, who will be the liaison between the various teams. IDRC has acquired unique

experience in financing project networks and has witnessed genuine synergistic effects when mechanisms are put in place to encourage exchanges.

### Trees for Profit

Several of the Andean countries control huge areas of the Amazon Basin. Because the Peruvian Amazon lowlands are a rather unhealthy environment in which to live, they have only very recently been settled. About 6.5 million ha of tropical forest have been cleared, but only a fifth of this area is actually under cultivation or in use as pasture. This is because the settlers abandon their land once its fertility is exhausted; 10 or 20 years later they burn off the trees that have grown back. The ashes of burned trees are the only fertilizer these “nomadic” farmers can afford.

IDRC has agreed to finance a cooperative project between the Universidad Nacional Agraria la Molina in Lima, Peru, and the University of Toronto, Canada, which will assess the potential of the tree and shrub species that grow up during the long fallow periods. Peruvian researchers have found that cecropia can be used in paper making, ochroma in the manufacture of insulating material, and guazuma in the manufacture of plywood. The commercial exploitation of many other species, which grow back naturally on abandoned clearings, would generate more wealth than the simple use of their ash. Two million settler families could end up profiting.

In Zambia, north of the Kalahari Desert, there are natural forests in which teak predominates. The forestlands block the advance of the desert and supply jobs, wood, and medication for the local population as well as forage for animals. Everyone agrees that these forests are important. Now, for the first time, there will be a study of the ecosystem of the teak forests. It will be done by the Forest Research Division of the Ministry of Lands and Natural Resources in Lusaka with

support from IDRC. More specifically, the scientists will learn how to preserve forests instead of having to regrow them from scratch.

### An Invasive Fish

In Africa, except in a few cases, fish farming has not been successful. Artisanal fishing in lakes or on the ocean accounts for almost the whole catch. The demand for fish, however, grows constantly. In the 1950s and 1960s, a large carnivorous fish, the Nile perch (*Lates niloticus*), was introduced into several East African lakes. The hope was that it would eliminate smaller, less-valuable species. *Lates niloticus* adapted so well that it now represents half the volume of the Ugandan fishery's catch. A controversy has arisen over the introduction of such a foreign species. Some say that the total catch will start to decrease because, in the end, the predators will overtake the native species on which they feed. Experts at the Uganda Freshwater Fisheries Research Organization hope to settle the controversy with research supported by the Agriculture, Food and Nutrition Sciences Division.

Some 1500 km to the south, in Malawi, the fisheries department of the Ministry of Forestry and Natural Resources hopes to guard against unpleasant surprises. The country has 300 small-scale fish farmers whose ponds range in size from 0.05 to 0.06 ha. The department is planning to make available to them an African version of the famous Chinese fish-farming system in which several species are raised together in the same pond. Malawi has a wide variety of fish species, and researchers hope to find local species of tilapia and carp that can be raised together to the profit of the country's fish farmers.

Aquaculture also includes shellfish raising and even the cultivation of marine grasses. In Gambia, West Africa, the fisheries department of the Ministry of Water Resources and the Environment, in Banjul, will introduce a system for



growing oysters on trays. IDRC-supported researchers in Sierra Leone and in Southeast Asia have already demonstrated that fixed, submerged trays are both efficient and inexpensive for oyster breeding. In Gambia, there are numerous tourist hotels that will guarantee a good market for oysters. IDRC has also undertaken to finance research into breeding scallops in Peru. Exporting them would guarantee a livelihood for coastal fishing families who have witnessed the collapse of the anchovy industry.

Finally, in Southeast Asia, the Agriculture, Food and Nutrition Sciences Division has financed a series of fish-farming research projects involving important species: milkfish in the Philippines and tilapia and carp in Thailand. Thai researchers will receive a grant from the Division as part of a series of projects ranging from investigations into the use of marine grasses as fish feed to state-of-the-art research into the genetic improvement of carp and tilapia.

### **Agricultural Software**

Most of the researchers supported by the Agriculture, Food and Nutrition Sciences Division are working on biological or technical problems. In effect, they are concerned with physical material such as plants and soil — agricultural “hardware” so to speak. The Division now also supports work on agricultural “software,” that is to say, the economics of new technologies.

In Sri Lanka, for example, the Division has agreed to support research at the Institute of Post-Harvest Technology to determine whether a market exists for the fish caught by shrimp boats. By-catches of this kind have an overall potential of 90 000 t/year; however, will consumers want them and, if so, under what conditions?

Also of concern to the whole Division is the important question of which factors determine the adoption of new technologies. In the Philippines, agricultural extension workers have praised the value of leucaena in

preventing erosion. What convinced some of the peasants to plant these trees on their mountainside lots? Why have some fish farmers decided to adopt new methods of producing fish fry in captivity given that they have traditionally caught them in the sea? What is it about the technologies that attracted them?

It has been said that good technology sells itself. It seems as though profitability is the primordial criterion, particularly if the innovation is aimed at low-income people.

The director of the socioeconomic research division of the Philippine Council for Agriculture and Resources Research and Development (PCARRD) at Los Baños will coordinate teams from six universities that will study the reaction of potential users to some 40 new technologies. The researchers hope to identify the determining factors in the adoption of new varieties of fruit and vegetables and new methods of growing coffee, cacao, and rice, and breeding methods for milkfish and shrimp. By allotting increasing importance to economic studies, the Agriculture, Food and Nutrition Sciences Division hopes to ensure that the research it sponsors will be genuinely useful and accessible to small-scale farmers and other end users.

### **Assisting Decision-Makers**

Which demographic policies should be adopted to limit pressure on available resources? What kind of education will guarantee the poorest schoolchildren jobs in the future? How are jobs to be created in the countryside and in the cities? How can small-scale farmers be guaranteed a decent income? How can the foreign debt be paid back at the same time as investments necessary to job creation are made? In essence, how does one build and manage a country?

### **Designing National Policies**

What follows gives no precise answers to these questions. It serves

simply to illustrate how IDRC's Social Sciences Division supports the research and thinking of economists, demographers, educators, and planners in the Third World who are trying to find original solutions to these problems.

The Division makes its resources available to some of the most innovative minds in Africa, Latin America, and Asia. Compared with the efforts of the countries themselves, its contribution is minimal. IDRC support, however, has been decisive in helping a number of research groups to survive difficult times — research groups that later went on to design and implement important national policies.

### **The Cruzado Plan**

On 28 February 1986, the Brazilian government inaugurated its Cruzado Plan. To stop inflation that was approaching 1000% per year, Brazil instituted a new currency, the Cruzado (replacing the Cruzeiro). It also fixed the currency's rate of exchange in relation to the U.S. dollar and froze prices and wages.

In adopting this extraordinary and dramatic course of action, the Brazilian authorities took many of their ideas from the work of economists at the Pontificia Universidade Católica, Rio de Janeiro. Since 1983, these economists have been working, with IDRC's support, on a computerized model of the Brazilian economy. In the end, this model enabled Brazilian decision-makers to simulate how the national economy would behave depending upon the strategy adopted. The model convinced them that a major devaluation would result in a comparable increase in production costs and further stimulate inflation. This led them to the Cruzado Plan, which represents a break with policies generally recommended by the IMF, namely devaluation, higher interest rates, and restrictions on internal demand.

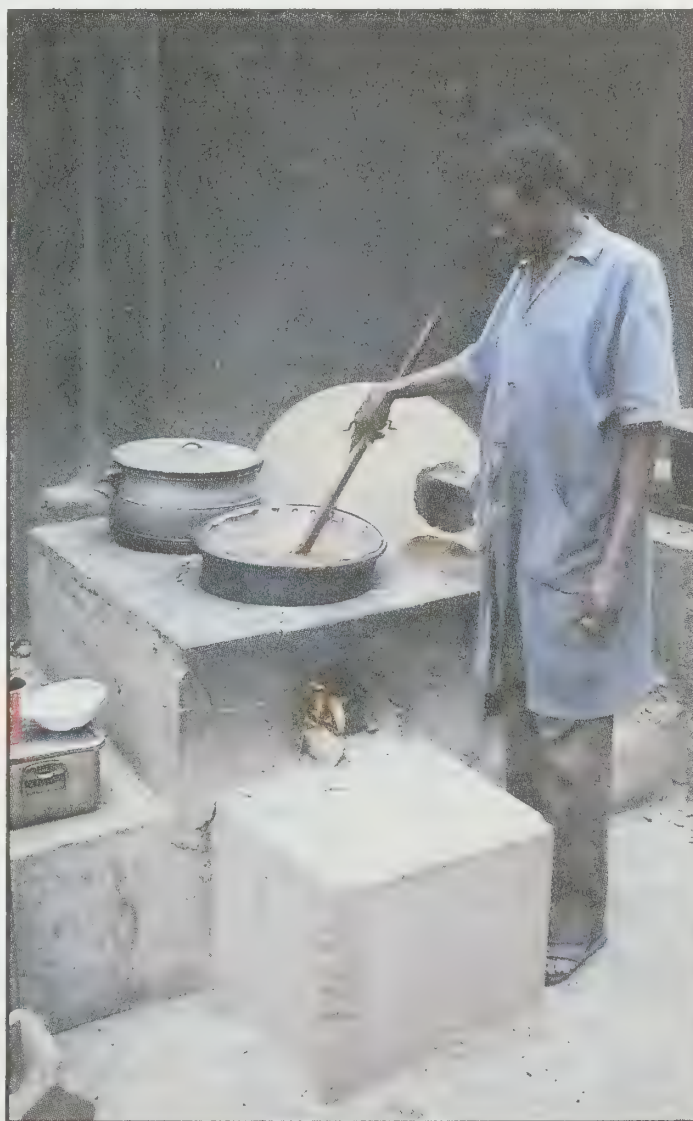
Observers from around the world are keeping a close watch on the application of the Cruzado Plan. In its first phase, it has managed to break the inflationary

spiral. In 1986, IDRC decided to continue giving support to the researchers at the Pontificia Universidade Católica, Rio de Janeiro.

That research team is only one of many in Latin America that have been supported by the Social Sciences Division and have recently made major contributions to the economic policies of their countries. In Argentina and Peru, the Austral and Inti plans also drew largely on the work of researchers supported by IDRC. It is also worth noting that outside of Latin America, specifically in Tanzania in East Africa, some of the recommendations of IDRC-supported researchers have been accepted by governments.

### **A Latin American Economy**

Whether in Latin America, Africa, or Asia, the Social Sciences Division is



*Only a few improved stoves have actually lived up to their promises.*



### **Energy Policies and Information**

In 1981, the Canadian government made a supplementary grant of \$10 million to IDRC to finance energy research. Since then, the Centre has supported numerous studies in this priority area. Research on energy policies has received special attention.

The Social Sciences Division, jointly with the United Nations University, has supported the work of the Energy Research Group (ERG), whose members include top energy specialists from the developing countries. ERG produced its final report in 1986, and this will be published in several languages. A dozen sectoral studies commissioned by ERG will also be made available.

The Social Sciences Division also agreed to support a series of studies on wood stoves (used mainly for cooking) in India, Sierra Leone, and Tanzania. The lack of firewood in the Third World has led to the appearance of large numbers of "improved" models, only a few of which have actually lived up to their promise. The researchers will evaluate the advantages and output of these new stoves. The work will be carried out in close collaboration with the users.

In Mexico, the Division will finance a study of the potential contribution of natural gas to Latin America's energy needs. Until quite recently, the oil-producing countries in the region had not even bothered to evaluate their gas reserves. Now some countries are trying to encourage the domestic use of gas to retain as much oil as possible for export. The study, to be done at the Colegio de México, will suggest how Latin American governments can get the most from their reserves of natural gas, whether through domestic consumption or regional consumption.

The Information Sciences Division has approved the financing of a computerized data base on renewable energy sources at the Regional Centre for Solar Energy Research (CRES) in Bamako, Mali, in West Africa. It has also made a grant to the Caribbean Energy Information System in Kingston, Jamaica. The system serves the member countries of CARICOM, the Caribbean Community.

seeking ways to ensure that its grants have the maximum possible impact. In areas where research is taking its first, faltering steps, the Division begins by supporting promising individual work. Conferences are then held to give researchers an opportunity to share their experience. As the results come in, common patterns begin to emerge. Finally, more meetings enable scientists to sketch theories that will become the subject of further experiments in other parts of the developing world. In the specific case of the macroeconomics research supported by the Division, a meeting of Latin American researchers is planned for January 1987 in Bogotá. It should constitute a major step in the development of an original economic strategy for Latin America. There have also been several occasions on which the Latin Americans have had the opportunity

to meet African economists who are also working on macroeconomic models.

### **Contract Farming**

In 1986, the Division funded an ambitious research project on contract farming in seven countries. It represents one of IDRC's chief contributions to economic research in Africa. In contract farming, a food-processing firm supplies seeds, fertilizers, and pesticides to farmers. Each farmer, in exchange, agrees to sell the harvest to the firm at a price agreed upon beforehand. Sometimes firms will even provide start-up credit, and they nearly always make arrangements to train the farmers in the use of any new agricultural technologies involved.

In East Africa, the Kenya Tea Development Authority is often pointed out as an example because of its success in mobilizing producers. In several other

Southern and East African countries, there is a wide variety of contract farming arrangements, most of them centering on export crops such as cotton, tea, coffee, sugar, or even tobacco. Many countries are attracted to this kind of contract farming because it avoids fragmenting the country into plantations with a colonial aura and leaves the initiative with the farmers. Mobilizing thousands of peasants to produce export crops also helps to pay the foreign debt. All these reasons make it likely that there will be a large increase in the number of projects dealing with contract farming.

Although at first sight it would seem that the results of contract farming are advantageous, there has never been an in-depth study of the benefits to small-scale farmers. The multicountry study that the Social Sciences Division has agreed to finance will enable teams from Kenya, Lesotho, Malawi, Swaziland, Tanzania, Zambia, and Zimbabwe to survey and assess national contract agriculture projects. Publications will then be produced and discussions held to give researchers an opportunity to pool the results. The intention is to have an exhaustive and accurate picture of contract agriculture by the end of the 2-year project. In the long run, decision-makers in Latin America and Asia, where contract agriculture is beginning to spread, will also benefit from the work done in Africa.

### **Rural Economists**

Agricultural production in several of the West African countries is stagnant, even in decline. Despite this, there are few studies of regional agricultural economics and most of those that are available are the work of expatriates.

Four divisions at IDRC — Agriculture, Food and Nutrition Sciences; Social Sciences; Fellowships and Awards; and Communications — have joined forces to support 16 agricultural economics research projects in the French-speaking countries of West Africa. The projects will be grouped into

two networks: one on the economics of agricultural production, the other on the economics of marketing. The project leader and two coordinators will be based at the Centre ivoirien de recherches économiques et sociales in Abidjan, Ivory Coast. There will be a major seminar at the beginning of the project and one 3 years later when it ends. Visits by the coordinators will help break down the isolation of the researchers and facilitate the comparison of results. Because the problems under study are directly linked to regional priorities, the results of the 16 studies will be published in short, concisely written leaflets for the use of policymakers in the region.

### **For Lack of Schools**

Last year, the Social Sciences Division provided support for a series of research projects on preschool education in countries in Latin America, Asia, and the Middle East. All these projects are linked by one issue: how to counter the educational handicap of children from underprivileged environments. In some countries — Chile, for example — the schools don't even play their traditional role as agents of equal opportunity. The Chilean government has asked municipalities and the private sector to take over education. The result has been a considerable drop in the quality of instruction and professional training in underprivileged districts.

Now, poor communities find they have to mobilize their own resources as best they can, without waiting for the state to do anything. The Centre for Educational Research and Development (CIDE) in Santiago can continue to rely on IDRC support to pursue its research into new methods such as enlisting family support to compensate for poor-quality schooling. A number of innovative experiments have amply demonstrated the relevance of preschool instruction programs. The Centro de Estudios y Atención del Niño y la Mujer (CEANIM), for example, has set up a network of



preelementary schools in the poorest districts of Santiago and is getting ready to establish similar programs in other marginal communities in the country. IDRC has agreed to support an evaluation of CEANIM's efforts.

### **Parallel Nursery Schools**

In Ecuador, the Indian communities in the provinces of Chimborazo, Cotopaxi, and Imbabura have their own network of nursery schools, the "Guagua-Huasis." This informal and adaptable network functions in parallel with the government-run system. The Social Sciences Division will finance a comparative study of the two networks done by the Instituto de Investigaciones Socio Económicas y Tecnológicas in Quito. Because the government has been forced to reduce its grants to preelementary establishments, the study's conclusions should help to determine how best to use the available resources. Decision-makers in Jamaica and on the West Bank of the Jordan River are also awaiting the results of IDRC-financed studies on preschool establishments.

In China too, where one-tenth of the population is under the age of 6, the Social Sciences Division will finance an evaluation of the present structure of preschool instruction. At the end of 1985, China had 172 300 nursery schools attended by 14 796 900 children, a total 14.3% higher than that in 1984. The evaluation will enable researchers at the Central Educational Research Institute in Beijing to visit 70 000 families in 10 provinces of China between April and November 1987.

### **1.2 Billion by the Year 2000**

Every time China has a census, the whole world holds its breath. The next one will be in 1990, and Chinese census takers will be better prepared than ever before.

In October 1983, IDRC financed a detailed demographic inquiry in Hebei and Shaanxi provinces and in the city of

Shanghai. Last year, it once again gave its support to the State Bureau of Statistics in Beijing for a new series of detailed inquiries in five more provinces and another major Chinese city.

These pilot studies provide training for a great many people in the most advanced methods of inquiry and demographic analysis. Consequently, it is expected that the 1990 census will be extremely accurate. Its results will help to determine just how realistic a goal Chinese population planners have set for themselves. Their aim is to stabilize the population (currently about 1 billion) at 1.2 billion by the year 2000.

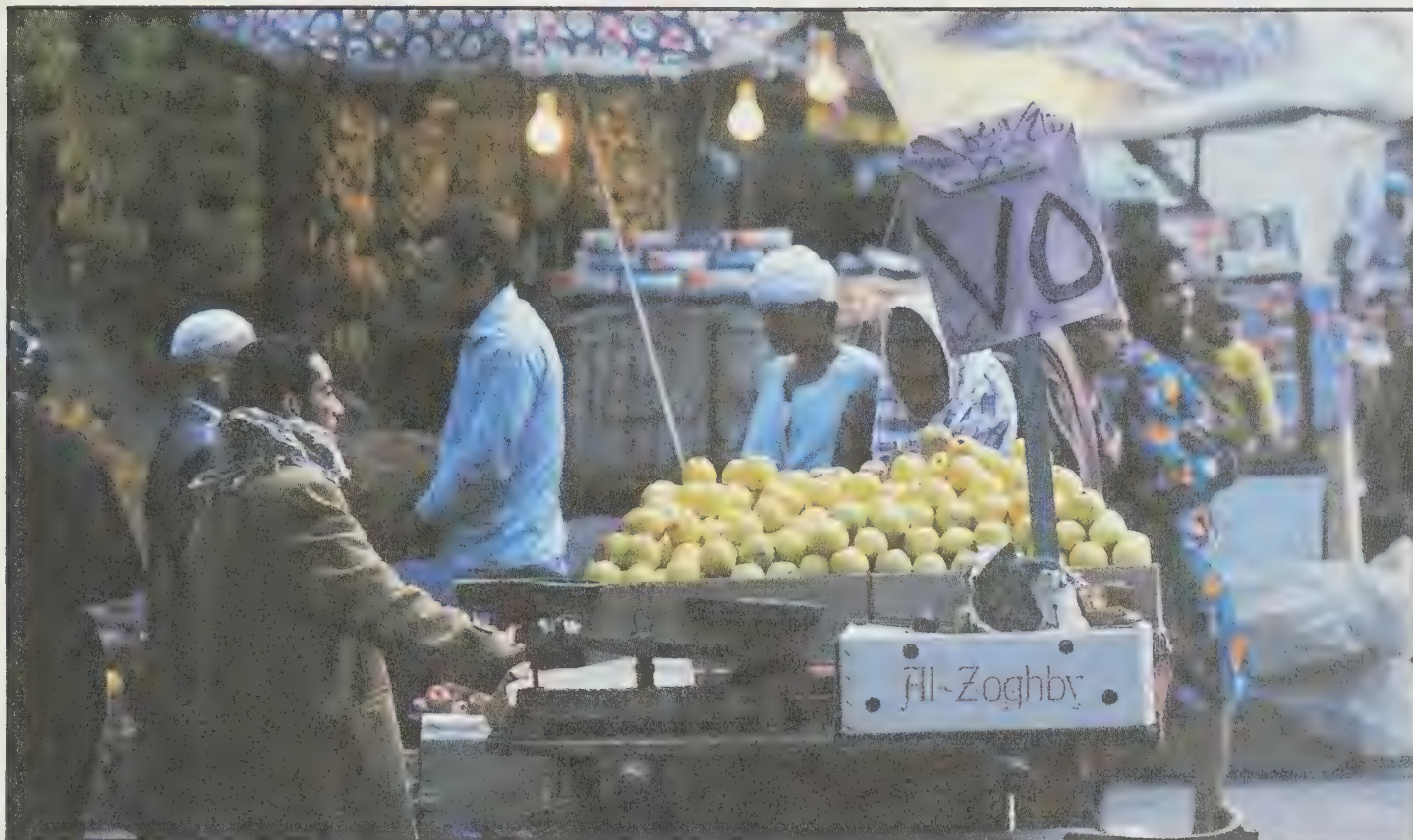
Since 1953, the Chinese government has been trying to reduce fertility by raising the age of marriage and encouraging birth spacing. In 1986, the government began to offer couples strong inducement to limit themselves to one child. In 1953, the annual birth rate stood at 37/1000. By 1979, it had fallen to nearly 18/1000. Is the intransigence of the Chinese authorities in their demographic planning justified? Are there not less coercive ways of achieving the same objectives?

There exists a considerable mass of statistics designated "secret" on the population of numerous regions at various times during the last 30 years. In a joint study by the Institute for Information and Control in Beijing and the Centre for Contemporary Asian Studies in Hong Kong, a large number of these unpublished statistical documents will be assembled. This will enable Chinese demographers to link various socioeconomic contexts with birthrates, beginning with the Great Leap Forward (1958-60), through the chaotic Cultural Revolution (1966-76), to the present liberal policy. Chinese authorities will thus be able to examine the impact of past policies objectively and provide a firmer basis for future policies.

### **The Lot of Refugees**

Africa and the Middle East are among the regions where famines and wars have





*It may be possible to modernize major parts of the food-processing sector and involve more women at the same time.*

produced the most significant demographic upheavals. More than half of the world's refugees have been taken in by countries that are among the poorest in Africa. In Tanzania, the sociology department of the University of Dar es Salaam will study how 36 000 refugees from Rwanda, who settled with government assistance, and 26 000 from Burundi and Zaire, who settled on their own, are managing with regard to finding work and fitting into their new social surroundings. The refugee problem is likely to persist in Africa, and governments and refugee aid organizations will be able to make good use of the researchers' conclusions.

The displaced populations of Lebanon, which are constantly growing, will be the subject of an exceptionally large-scale inquiry to be executed jointly by experts at Saint Joseph University in Beirut and Laval University in Québec. Here, too, the results will be extremely useful, not only to the Lebanese government but also to the numerous international organizations trying to

maintain adequate health services for displaced families. The researchers will pay special attention to the educational needs of the children who are in danger of becoming delinquent.

### **The New American City**

The large cities of the industrialized world grew over a period of centuries in response to enormous increases in wealth. Many of the cities of the Third World, however, are simply vast assemblages composed mainly of people with no regular income and no professional skills. Recent economic upheavals have greatly diminished the resources available to municipal authorities in Latin America. How are they to use their meagre means to provide essential services? Would it perhaps be wiser to encourage the establishment of regional urban centres? Urban researchers and planners in Latin America have a great many more questions to ask. Seven teams of researchers, supported by IDRC and coordinated by the Buenos Aires office of the International Institute for Environment



and Development (IIED), based in London, England, will spend 2 years trying to paint an accurate picture of Latin America's cities of tomorrow.

### **Urban Agriculture**

The attraction of urban agglomerations lies mainly in the employment opportunities they offer. Many of these jobs, however, are in the informal sector. In Jamaica, for example, the streets have been invaded by women selling foods. Women researchers at the University of the West Indies in Kingston are going to study the economic context in which these women work. They plan to propose mechanisms to provide the street vendors with access to credit and make it easier for them to purchase supplies.

Sometimes the fruit and vegetables offered for sale on the street are grown nearby. At least 24 municipalities in developing countries have created programs to encourage agricultural production within city limits. City Hall in Addis Ababa, Ethiopia, has encouraged the poor to cultivate vacant lots. In Tanzania, the Social Sciences Division has agreed to support work by researchers at Sokoine University of Agriculture on the potential for urban agriculture.

### **City Jobs and Country Jobs**

There is still, of course, a bright future for farming in the countryside. It will be a long time before consumers prefer sidewalk cabbages to those grown on the farm.

Now that a great many developing countries have increased their food production to the level of self-sufficiency, priorities are changing. In several countries, the most important thing now is to create jobs, tens of millions of jobs. If the cities are to remain manageable and not collapse from overpopulation, most of these new jobs must be created in rural regions and regional centres.

The province of Jiangsu in China has been remarkably successful in creating

employment outside the major urban centres. With 60 million inhabitants, it is one of the most populous and prosperous provinces in the country. In 1984, about 30% of Jiangsu's industrial production originated in rural communes, even though the province contains China's largest city, Shanghai, which has a population of 12 million. These remarkable results are to be attributed to the open-mindedness of the authorities. They have permitted the creation of all kinds of cooperatives, private enterprises, and state corporations. They have allowed the market to reward risk takers and many connections have been established between rural industries and urban markets.

Jiangsu Province's Academy of Social Sciences, in cooperation with the Economics Department of the University of British Columbia, will draw up a detailed description of the policies applied by the authorities in obtaining these impressive results. This collaborative effort will enable the Chinese researchers to emerge from their isolation and will give their Canadian counterparts an opportunity to help disseminate the results. A great many countries are keen to learn about Chinese policies that have helped to create nonfarming jobs in rural areas.

### **Legislative Cooperation**

When the authorities of the People's Republic of China legalized the creation of private and mixed enterprises in 1978, they found that they had to write a whole new set of laws. How would they introduce regulations for a market economy into a country with a planned economy? Above all, Chinese legislators urgently needed regulations for corporations and partnerships, securities, product warranties, and so on. This persuaded the Office of the Secretary and General Counsel at IDRC of the importance of financing an experiment in legal cooperation. The research is to be jointly done by specialists from the

Faculty of Law of Queen's University in Kingston, Ontario, and the Centre for Research in Economic Law in Beijing.

### **Population Resource**

One of the constant concerns of IDRC's program officers is to provide Third World scientists with the chance to keep up to date as researchers. Most grants are made to small teams working on specific problems. There are, however, other grants that create important learning situations for young researchers. Three of the Social Sciences Division's grants in 1986 are contributing to the development of new skills in demographic research in Africa and the Middle East, and in science and technology policy research in East Africa.

The demography departments of many sub-Saharan governments are still directed by foreigners or by young people with no training. Ironically, sub-Saharan Africa is the only region of the world where the population growth rate is still rising. The Social Sciences Division will finance training scholarships for 10 Africans to study at the Master's level in demography at the Cairo Demographic Centre in Egypt. In conjunction with the Ford Foundation and the Population Council, both in the USA, the Division will also continue to make numerous scholarships available to young Middle Eastern demographers. During the first phase of this program, half the recipients were women.

### **Science Policy**

The Social Sciences Division has agreed to continue its support for a network of young science and technology policy specialists in Ethiopia, Kenya, Tanzania, Uganda, Zambia, and Zimbabwe. Since 1982, these researchers have conducted about 20 studies on subjects ranging from the technological behaviour of cooperatives to native technology used in alcohol fermentation. Each year they have held a meeting in a different country. Some of them have begun to teach science policy in universities; others are regularly consulted by their governments.

In the long run, the contributions of this new generation of national experts will most likely be invaluable. Consider the expensive and underused hydro plants, grain silos, sugar refineries, and cement factories that clutter up the landscape of Africa and the Third World in general. Just think of what might have been achieved had the millions of dollars that were spent on them been channeled into the use of local skills and technology. It might not have resolved all the problems, but at least valuable local experience would have been acquired.

Inevitably, the best minds in the Third World will play a decisive role in the development of their countries. As for IDRC, it sees its role as that of a catalyst in the development of the most valuable resource the underprivileged regions of the world possess, brain power.



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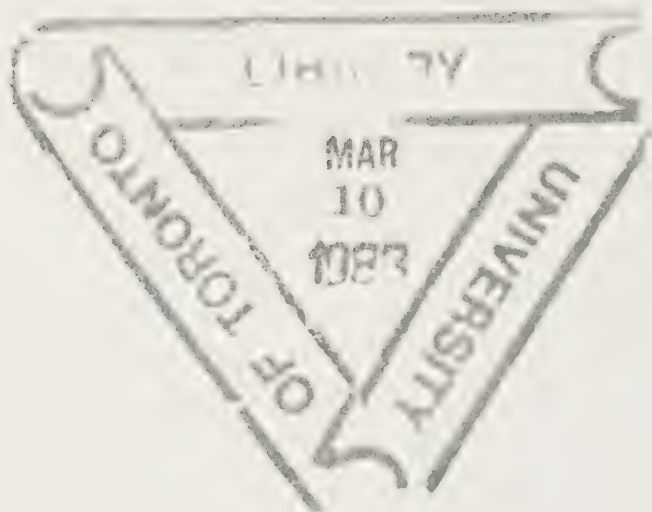


IDRC  
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# SEARCHING

Research in Small Countries





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*Il existe également une édition française de cette publication.*

*La edición española de esta publicación también se encuentra disponible.*







# INTRODUCTION

Increasingly, evidence mounts that the most critical single obstacle to development is the widespread incidence of "absolute poverty." Moreover, the case can be made that the most effective tools to overcome that obstacle are those of science and technology.

Such an analysis of cause and cure is likely correct for each one of the more than one hundred nations desperately endeavouring to raise the social and economic standards of their peoples. Again and again, absolute poverty is being identified as the most significant barrier to development. It is a circumstance that spawns illiteracy, malnutrition, and pervasive unemployment. Absolute poverty contributes as well to environmental degradation. The World Commission on Environment and Development (the Brundtland Commission) reported last spring that "Those who are poor and hungry will often destroy their immediate environment in order to survive. They will cut down forests; their livestock will overgraze grasslands; they will overuse marginal land; and in growing numbers they will crowd into congested cities . . . . A world in which poverty and inequity are endemic will always be prone to ecological and other crises."

The effectiveness of science and technology as a means of solving developmental problems was emphasized by an earlier world commission, chaired by Lester B. Pearson, former Prime Minister of Canada. In 1969, that commission stressed that the developing countries must "select those areas where science can make its greatest



*A scientist at the Laboratorio de Estudios Científicos y Tecnológicos (LACTEC) research center in Argentina explains a water treatment technology. (RRC - Provided by Ian T. Head (left))*



developmental contribution, . . . choose the most suitable technology, and . . . concentrate their resources in a coherent science policy that is reflected in education and training as well as in research." One of the outcomes of the Pearson Commission was the creation in 1970 by the Parliament of Canada of IDRC, the first organization in the world created specifically to assist developing countries to perform research and to enhance their own scientific and technological competence. In 1987, a report to the Swedish Parliament stated that "The establishment of IDRC can be regarded as the most significant initiative taken by any industrialized country to support research in developing countries."

Important as is the recognition of absolute poverty as the basic development problem (not simply as a manifestation of underdevelopment), and helpful as is the acknowledgment of the contribution of science and technology to solving the problem, the challenges facing decision-makers and scientists remain daunting as they endeavour to match resource supply and demand. Nowhere is this more evident than in the 32 independent countries with a population of less than 750 000 each. In these nations, financial and human resources are insufficient to build and staff the facilities required to conduct adequately the research needed to solve problems. Even in those instances where national universities have been created, these cannot be expected to demonstrate either the breadth of interest or the depth of ability required to tackle simultaneously the multitude of issues pressing upon the communities they serve. Other, often regional, solutions must be designed; so must networks and a variety of linkages among developing countries themselves.

Some of the material that follows endeavours to cast light upon this "smaller country" problem. Statistics do not always reveal the particular difficulties faced by these countries. Although science and technology in developing countries world wide have increased immensely in the 17 years since IDRC was created (from about 3% of total world expenditure on research and development in 1970 to 6% in 1982), this increment has not fallen evenly. Larger countries, such as India and Brazil, account for a much larger share of that percentage gain than do tiny countries such as St Lucia or Comoros.

The absence of a functioning university does not eliminate the possibility of research funding from IDRC or other organizations, but some kind of capacity to undertake methodologically sound investigations must be present. How to develop that capacity is a task attracting increased attention from the Centre. Of increasing concern as well are those research activities designed to enhance the skills of entrepreneurs in a range of technological endeavours that, in countries big and small, create employment opportunities and, in turn, increase the real demand for agricultural and other commodities. It is in this way that economies burgeon and societies develop.

An example of that kind of activity, research in a local sector demanding considerable technological knowledge and skill, is illustrated in the photograph (on the previous page). Work of that kind demonstrates that in this age of highly competitive global-scale activities, there remain many instances where comparative advantage favours the small, local enterprise. This advantage is found in countries of all sizes and, in the result, is of benefit to countries both developing and developed. This is good news in an era where our interdependence demands that we must all benefit, or we will all suffer.

*Ivan L. Head*  
*President, IDRC*

# WHAT IS IDRC?

The International Development Research Centre (IDRC) is a corporation created by the Parliament of Canada in 1970 to stimulate and support scientific and technical research by developing countries for their own benefit.

The fields of investigation to which IDRC gives its financial and professional support include farming; food storage, processing, and distribution; forestry; fisheries; animal sciences; energy; tropical diseases; water supply and sanitation; maternal and child health; education; population studies; economics; urban policies; science and technology policy; information systems; industrial engineering; earth sciences and building materials and techniques; and dissemination of research results.

Although IDRC is funded entirely by the Canadian Parliament, to which it reports annually, its operations are guided by an international 21-member Board of Governors. Under the IDRC Act, the chairman, the vice-chairman, and 9 other governors must be Canadian citizens; in practice, 7 of the remaining 10 governors are from developing countries.

The Centre's programs help developing countries to build the scientific competence of their institutions and their researchers so that these countries can work to solve their own problems. Opportunities are given to researchers to broaden their experience through practical work assignments or advanced studies.

IDRC emphasizes the role of the scientist in international development and encourages Third World countries to draw on the talent of their own scientific communities. Building a strong local base for future research is an important objective of most IDRC-supported work. Research projects are identified, designed, conducted, and managed by

developing-country researchers in their own countries, to meet their own priorities.

IDRC helps to create and supports international research networks through which developing countries can learn from each other, share common experiences, and conduct similarly designed studies in areas of mutual concern. It also promotes cooperation between developing-country researchers and their counterparts in Canada through so-called cooperative projects. Up to last year, most projects in this category were managed by a single division. Now, all of IDRC's divisions can fund regular projects — conceived, realized, and managed by Third World scientists — as well as cooperative projects.

## Cooperative Projects

Most of IDRC's funds are contributions to research conceived, managed, and done by Third World scientists. But the Centre also supports collaboration between scientists in developing countries and their counterparts in Canada — whether academic, governmental, or private. Cooperative projects can be in all research areas supported by IDRC (as listed at the beginning of this section) and in which there is recognized Canadian expertise.

## Research Programs

Agriculture, Food and Nutrition Sciences — In this group of related sciences, emphasis is on farming systems, social forestry in arid and semi-arid lands, and aquaculture. Specific areas of support include previously neglected food sources such as root crops, food legumes, and



oilseeds; agroforestry (growing trees and crops together); multiple cropping systems; improvement of pasturelands; use of nonconventional feeds for animals; fish and shellfish farming; postproduction systems for the preservation, processing, and distribution of food crops, fruit, and fish; and the economics of small-scale farm production and marketing.

**Health Sciences** — The division's support is concentrated in five broad areas of applied research: health services, water supply and sanitation, maternal and child health, tropical and infectious diseases, and occupational and environmental health.

**Social Sciences** — Research supported by the division is designed to improve understanding of the social and economic issues related to international development, permitting researchers and policymakers to formulate policy options in several thematic areas. These include education, population, science and technology, energy, urban development, economics, and rural development. Support is also given to a limited number of national and regional institutions in the social sciences and to research on problems of special regional concern.

**Earth and Engineering Sciences** — This division supports research in three main areas. One program aims at helping small- and medium-scale enterprises in developing countries to create jobs. The Earth Sciences program focuses on hydrology, hydrogeology, geotechnics, and small-scale mining technologies. Shelter is the theme of a third program supporting research using local resources to develop improved low-cost construction materials and techniques.

Until last year, this division was exclusively managing IDRC's cooperative programs bringing together Third World and Canadian scientists. The division now funds regular projects — imagined, managed, and done by Third World scientists — as well as cooperative projects.

## Information Programs

**Information Sciences** — Support given by the division helps developing countries to establish regional and national information systems and improve library infrastructures at these levels; participate in international information networks; create specialized information centres (serving the region or world) on development-related subjects; strengthen sectoral information programs, especially in agriculture, health, population, industry, the environment, cartography, and social issues; and develop information tools and methods. The division's computer systems group provides internal services and distributes MINISIS, a bibliographic software package designed by IDRC, to developing countries. In addition, a library and micrographics unit serve IDRC staff, the Canadian development community, and IDRC-supported projects.

**Communications** — Services provided by the division include the publication and dissemination of the results of IDRC-supported research via print and film media, public affairs, and translation. The division also aims at strengthening the ability of research institutions in developing countries to prepare and disseminate scientific and technical information, particularly on projects supported by IDRC.

**Fellowships and Awards** — The division funds the training of junior and senior Third World scientists, managers, and planners working in sectors covered by IDRC's program divisions. Preference is given to individuals from the least-developed countries and the emphasis is on professional upgrading rather than basic training. In addition, the division supports practical, nondegree, group training to improve technical, research, and administrative skills of individuals. A portion of the division's funds is also used to encourage the involvement of young Canadian researchers in scientific areas of concern to IDRC and to expose them to the





*Traditional gourd carving in Peru — handicrafts are an important source of income in most developing countries.*

problems of the developing world. These doctoral students are posted to a Third World country for studies, research, or placement.

### **Funding and Selection of Projects**

Each program division channels funds to institutions in developing countries (government departments, universities, research centres, etc.), to international and regional institutions, and to Canadian institutions. The recipient is expected to pay a portion of the costs.

All projects are reviewed by IDRC's professional staff and assessed in light of factors such as

- Development priority: Is the proposal consistent with national or regional development goals?
- Regional applicability: Are the research findings likely to be applicable in

developing countries or regions other than the one in which the research takes place?

- Usefulness: Will the research help close gaps in living standards or lessen the imbalance in development between rural and urban areas?
- Local resources: Will the project make full use of local resources and research workers from the region?
- Training: Will the project result in better trained and more experienced researchers and more effective research institutions?
- Research area: Does the research fall within IDRC's areas of concentration?

When IDRC agrees to support a project, it enters into an agreement with the developing-country institution. In it are stipulated the project's purpose, research methods, payments, and a



schedule for the research and progress reports.

### **The Program Officer**

Although IDRC itself rarely undertakes research, its program officers are highly qualified professionals. One of their main functions is to respond to project ideas proposed by developing-country researchers and to evaluate the suitability of proposals in light of the criteria stated earlier.

Once a project has been approved in principle, the program officers collaborate with the institution submitting the proposal in further refining the project idea, provide administrative and technical advice, and help in preparing a project budget. Program officers are based either at IDRC headquarters in Ottawa or in one of the regional offices. In the regions, they help determine research priorities and prepare detailed annual plans of projects to be defined and developed, workshops and seminars to be organized, and

maintain contact with research institutions throughout the region.

### **Project Approval**

Before funds are appropriated, a project proposal must go through a formal approval process.

Authority to approve projects for which funding exceeds \$100 000 lies with IDRC's Board of Governors. It delegates approval authority to the President and the Vice-Presidents for projects up to \$100 000, to Directors of individual divisions for projects up to \$50 000, and to Deputy Directors for projects up to \$15 000.

When a project has been approved, funds are appropriated by the Office of the Treasurer. The Secretary's Office prepares a Memorandum of Grant Conditions (MGC) governing all aspects of the relationship between the signing parties. Once the MGC has been signed by the recipient, funds can be forwarded.

# R&D IN SMALL COUNTRIES

This introductory section focuses on the situation and particular problems faced by small developing countries (with a population of less than 10 million) in research and development (R&D) activities. Decisions on the level and direction of allocation of resources to research are, of course, those of the countries themselves. Nevertheless, an organization funding research in these countries has an interest in understanding the options so that its own decisions on the level and type of activity to support make the best possible contribution to strengthening national endeavours.

The contribution that R&D makes to the development process is widely accepted as vital. This process implies access to new knowledge and new ways of embodying and exploiting existing knowledge. The particular circumstances in which small countries gain access to existing knowledge, adapt it to their specific purposes, or contribute to generating new knowledge are part of an extremely complex global system of relations. The extent to which research can contribute depends on the level of resources (funds and staff for research) and the allocation of scarce resources to a multitude of needs; this goes hand in hand with the necessity to look at what mechanisms are most productive when the resources are as limited as they are in small-country cases.

The research “system” (really a misnomer because activities lack the interconnectedness that this implies) thought appropriate for a particular country will depend on its resource endowment and the development objectives and strategy. This gives rise to a vast range of different, individual situations and sets of choices for decision-makers. There are, however, some common considerations that deserve

highlighting. One possible assumption is that small countries will have limitations in terms of potential economic size so severe that their development options will be significantly different from larger countries.

This section begins to explore whether there are also significant limiting factors in the type and level of R&D that can be economically justified. In many areas of research, a certain minimum critical mass is required in terms of human and financial resources before R&D can be productive. The low level of resources that small countries can devote to R&D may mean that the input required to achieve even this minimum is beyond their means. There is an additional economic argument that suggests that production-related research in small countries is likely to be more expensive per unit of production than in larger countries — the research costs required on a crop that is grown on 50 000 ha in one country and 150 000 ha in another may *not* vary greatly; the research cost per hectare under production will be quite different.

## How Many Small Countries?

Clearly, any definition of “small countries” is arbitrary and depends on the issue or problem being investigated. The imprecision of the term requires a definition each time “small” is the focus. The principal criterion used here for labeling small countries is that of population. This also serves as a reminder that the richer industrialized countries with relatively small populations face particular problems of R&D strategy as well.

Studies of “small countries” have proliferated because many countries that



have gained independence in the last 30 or so years belong in this category. Various reports have shown a general congruence between population size and other measures of size although not a clear correlation. A more detailed assessment of criteria would be necessary to classify individual countries, but this is not necessary for this review. We will use only the criterion of population size, recognizing that some countries with a small population may well have other elements that make some of the limiting factors less relevant. Depending on particular studies, the cut-off population size used varies between 5 and 10 million; here, 10 million has been selected as the upper limit to the category.

What numbers are included in our category? Table 1 shows that in 1985 about 67% of all developing countries (used here interchangeably with "Third World countries") had a population of less than 10 million and 52% less than 5 million. The gross national product (GNP) of all but five of the 77 small countries for which there are data is under US \$10 billion. Sixty-six of these countries have a GNP below the US \$5 billion mark. (World Bank and other internationally

available data on GNP and R&D have been kept in US dollars.)

One consistent finding is that there is no relation between country size and GNP per capita. Smaller countries do not necessarily have lower per capita incomes. A growing literature now studies the relationship between country size and economic performance — some figures suggest that small countries exhibit wider growth rate fluctuations and have tended to experience recession more severely, but the evidence is far from conclusive. Other studies relate size and the distribution of imports and exports as a percentage of GNP; these suggest that imports and exports account for a greater percentage in smaller countries, with a consequently greater degree of dependence on international markets. So there appear to be some distinguishing features in economic development characteristics, although the evidence is preliminary. Are there distinguishing features in their research systems and potential?

### Developing-Country Research

The access of small developing countries to the outputs of R&D — their own and others' — is crucial to their

Table 1. Country size and gross national product (GNP) in developing countries, 1985 (US \$ billion).

Population (million)	GNP					Total
	Less than 1	1-5	5-10	More than 10	No GNP data	
<b>0-10</b>						
0-1	21	10	1	—	4	36
1-5	5	17	2	4	3	31
5-10	—	13	3	1	1	18
<b>Sub total</b>	26	40	6	5	8	85
<b>More than 10</b>						
10-20	—	3	5	5	4	17
More than 20	—	1	5	16	3	25
<b>Total</b>	26	44	16	26	15	127

Note: Intervals are rounded. 1 United States dollar (US \$) = 1.33 Canadian dollars (CA \$).  
Source: World Bank Atlas, 1987.

Table 2. Research and development (R&D) expenditures by developed and developing countries, 1980 and 1984.

R&D expenditure (US \$ billion)		Percentage share		
		R&D	GNP	Population
<b>Global 1980</b>	<b>207.8</b>			
Developed	194.9	94	79	19
Developing	12.9	6	21	81
<b>Global 1984</b>	<b>240.0</b>			
Developed	226.0	94	79	21
Developing	14.0	6	21	79
<b>OECD 1984</b>	<b>189.8</b>			
USA	98.1	52	44	29
Top 5	167.2	88	78	66
Bottom 5	0.5	<1	1	4
Countries less than 5 million population (6 total)	2.4	1	2	3
Countries less than 10 million population (12 total)	6.8	4	6	8
<b>Third World (1980)</b>	<b>12.9</b>			
Sub-Saharan Africa	0.8	6	8	11
Arab States	1.0	8	24	7
Latin America	3.9	30	31	11
Asia	7.2	56	37	71

Note: 1 United States dollar (US \$) = 1.33 Canadian dollars (CA \$). Percentages have been rounded.  
Sources: Unesco 1985 Statistical Yearbook; *OECD Observer*, 1986; and IDRC internal documents.

development and their level of activities in this area is low even as a percentage of their limited resources. There are two important observations: first, the level of R&D activity in the Third World is low in comparison to the industrialized countries; second, much of this R&D is concentrated in the larger developing countries (e.g., Argentina, Brazil, China, India, Korea, and Mexico).

Global and national figures of expenditures on R&D are still extremely unreliable. The best estimates available indicate that global R&D expenditures for 1984 were some US \$240 billion with the Third World accounting for 6% of the total or US \$14 billion (Table 2). (These total figures include, of course, the considerable expenditure of a number of industrialized countries on defence research.) The developing countries' share

of the world GNP is 21% with about 79% of the world population. As mentioned earlier, within the developing countries group, there are marked regional and country disparities. Using data for 1980, there is a clear concentration of R&D effort in Asia with 56% of total developing-country R&D expenditure followed by Latin America with 30%. Within regions, there is an even sharper contrast between countries. Nigeria accounts for 50% of sub-Saharan Africa's research effort (excluding the Republic of South Africa). In Asia, China is responsible for an estimated 40% of the regional total. Similarly, Brazil alone was responsible for 50% of the R&D effort in Latin America, and Argentina and Mexico raise the level of concentration to 77% of the regional total. What this means is that about US \$8–9 billion of developing-



country R&D expenditure of US \$14 billion is accounted for by eight countries.

## The OECD Case

This is not so different from the industrialized countries. In the Organisation for Economic Cooperation and Development (OECD) group of 24 industrialized countries, the largest five countries account for 88% of the total OECD expenditure on R&D. The head of the science and technology (S&T) indicators unit of OECD reported that the “second” five countries, which include Canada, spent a further 10% of all resources devoted to R&D in the OECD area and added “then there is a set of smaller countries spending 1–2%. This shows very clearly that research is an extremely concentrated activity and that for most countries the problem is not so much to *undertake research, but to gain access to research from elsewhere*” (emphasis added). These 14 smaller OECD countries nevertheless account for a total research budget of between US \$2 and \$4 billion (an average of US \$140–280 million/country).

The OECD has considered the problem of “smallness” (in this case, defined by GNP) in relation to S&T policy and economic growth in its small member countries. Different industrial strategies have been suggested (e.g., finding niches in the market, cooperating with other countries, and specializing) requiring different R&D strategies to support them. These countries face the problem of not having big enough domestic markets to generate competitive economies of scale or, in some cases, to pay back R&D costs. Academic studies have proposed general guidelines for the identification of areas where small industrialized countries might establish relatively large R&D programs:

- Areas where it is important for the small country to pursue an indigenous R&D effort to meet its social and economic objectives;

- Areas where current R&D makes it natural to establish “axes of penetration”;

- Areas in keeping with the small country’s R&D capability regarding cost, workforce, type of activity, and field of science and technology; and

- Areas useful to a strategy for strengthening the small country’s position relative to the international division of labour.

Size is mentioned as a specific factor limiting the scope of activities and requiring careful allocation of available resources in several OECD reviews of national science policy: for Iceland “. . . given its smallness and given that its competitors base their economic performance in large measure upon their ability to harness their own scientific and technological strengths, Iceland cannot afford not to have a clear science policy” and Norway “when discussing the features specific to their [S&T] system, Norwegians usually begin by saying quietly, with a hint of reserve — Norway is a small country. The examiners reporting on social sciences policy in Norway heard the same comment from nearly everyone they spoke to and added that the size of a country necessarily limits the range of research fields open to it and makes choices harder.”

## R&D in Small Developing Countries

This reference to the OECD experience underlines that small *developing* countries are not alone in having to make tough R&D decisions and to limit the areas in which they can build R&D capacity. The resource constraint is always present (indeed even for the larger industrialized countries) but it does “bind” at different levels. The situation of the small developing countries is difficult to describe in detail given the absence of reliable country data. Notwithstanding the relative weakness of the R&D effort, it is important to enumerate reasonably accurately the level

**Table 3. Financial and human resources in R&D — estimates for selected developing countries.**

Country	Population mid-1985 (million)	R&D budget		Number of researchers	Sectoral funding focus (%)
		Total R&D (US \$ million)	Percentage of GNP		
Botswana	1.1	4.3 (1984/85)	0.4	235	Agriculture 75 Technology and energy 23
Costa Rica	2.6	5.2 (1981)	0.2	850	Agriculture 46 Social development 19 Health 15
Guatemala	8.0	14.8 (1983)	0.2	1094	Energy and industry 29 Agriculture 22
Honduras	4.4	9.2 (1985)	0.1	612	Agriculture 76 Social development 11 Health 9
Jordan	3.5	4.2 (1984)	0.1	1472	Industry, natural resources, and construction 42 Agriculture 21 Humanities 17
Malawi	7.0	4.5 (1984)	0.4	477	Agriculture 96
Mauritius	1.0	4.3 (1985/86)	0.4	263	Agriculture 94
Singapore	2.6	100.6 (1984/85)	0.6	2401	Engineering and technology 72 Medical sciences 13 Natural sciences 10
St Lucia	0.1	1.2 (1985)	0.7	27	Agriculture and environment 75 Health 25
Trinidad & Tobago	1.2	19.0 (1985)	0.3	186	Agriculture 49 Energy and industry 38 Marine and environmental 13

Note: 1 United States dollar (US \$) = 1.33 Canadian dollars (CA \$).

Source: Data obtained from national surveys and country studies undertaken for IDRC by local researchers.

of resources devoted to R&D and their sectoral concentration. It seems likely that even the cost of collection of information on resources devoted to research is more expensive per researcher or research institution in smaller research "systems."

Table 3 shows information on the R&D resources of a number of small developing countries from different regions of the world. In most cases, these come from studies of national research systems undertaken for IDRC by local researchers — but even these studies relied for the most part on existing, although sometimes difficult to access, information. In other cases, where studies were started with no existing information, reports have still to be submitted. A number of these cases are also illustrated

by "boxes" in the text to give more feel for the context in which the allocation decisions of individual countries are made.

Most of the countries included in Table 3 have a relatively small number of institutions engaged in research, seldom more than 10, although each institution may contain several research units (e.g., departments or specialized centres within a university). In almost all cases, research is funded overwhelmingly from public funds; there is little private-sector research except where a parastatal institution is linked to a growers' interest group, usually in the case of an export crop such as sugar or coffee. Reliance on external support varies greatly depending on country and sector but can reach 50%.



Countries are typically devoting between 0.1 and 0.4 % of their GNP to research. Several have targets to increase research to 1 % of GNP (the major industrialized countries spend closer to 2 %), but even these targets seem elusive in the foreseeable future.

Figures for the number of researchers, in most cases, vastly overstate the real time devoted to research, because it is only one of several functions performed by staff of scientific institutions, particularly universities. Indeed, a number of country studies suggest that with increased university enrollment, staff time devoted to research is decreasing. In 1980, for example, staff time allocated to research in the Faculty of Agriculture of the University of Jordan was on average 50 % of the total available, whereas in 1984 it had fallen to 25 %. During 1980–84, the number of students enrolled had doubled but professional staff had increased by only 20 %. Country studies also comment on the need to take greater advantage of the research resource offered by universities and to link them into the national research effort, particularly in view of the overall shortage of resources and the wide range of issues requiring research.

The S&T issues facing small developing countries are complex; they are attempting to meet domestic economic and social needs, for which they require a contribution from domestic S&T, but are doing so in an international environment that is undergoing rapid technological change and in which “conventional” wisdom is in question. One convention was that basic industrial activity (the “mature” industries) requiring low capital and high labour inputs would eventually shift to countries that have a comparative advantage in those factors of production. Concomitantly, industrialized countries would shift into high technology, capital-intensive productive activities. There is some feeling that what is happening does not follow this

convention. Basic industrial activities are becoming more technologically intensive. Consequently, some industries expected gradually to decline in the industrial countries are now experiencing a “renaissance” and are the subject of considerable R&D effort.

What this means is that as the large countries invest more at this level of productive activity, it will raise the technological content of commodities and, thus, increase the threshold level of S&T activity in terms of the necessary supporting S&T infrastructure. There are important economies of scale in the production of many major consumer goods. These may present major barriers to starting production except where countries can identify particular “niches” in the range of productive activities. It is also likely that the threshold level of capital to invest in R&D on industrial



*In Swaziland, a veterinary scientist examines a goat for fleas, which can be vectors of diseases.*

activities is increasing for manufactured commodities, limiting the range of feasible goods (and research) for small countries' production. The implications of a changing international division of labour and of the complexity of commercial and investment decisions facing small countries argue in favour of their building some independent capacity to carry out research on policy (economic, S&T, etc.). They need to ensure that they have adequate access to external technical and marketing information and an ability to analyze this information in such a way that major policies and investment decisions are based on the best available knowledge.

## The Agricultural Sector

But for many developing countries, large or small, agricultural research is the most important research sector. The issues of economies of scale, minimum critical mass, and the potential to tap external research findings are relevant here. It is useful to explore some of these issues specifically for agricultural research as it is typically the largest and most organized sector (see Table 3 and boxes on individual countries). It is also the sector that is the best documented and where there has been some preliminary analysis of the specific factors mentioned earlier.

### Jordan

With annual increases of 4.1% in GDP over the last 5 years, Jordan has a growth record that compares very favourably with other developing countries. The major contribution to GDP is from the services sector (64%) and the two main productive sectors are mining and manufacturing (28%) and agriculture (8%). A large part of the country's development effort has been in investment in all levels of education.

Research has developed markedly since the 1950s. Agricultural research, for example, was formally organized in a department within the Ministry of Agriculture in 1958. The University of Jordan was established in 1962 and has undertaken research in arts and humanities, economics and science, agriculture, medicine, and engineering. The Royal Scientific Society (RSS), founded in 1970, has carried out research in economics, industrial applications, solar energy, and construction.

The RSS has an active program of contracting its consultancy and research services to private- and public-sector institutions in Jordan and, to some extent, to other countries in the region. This has enabled it to generate substantial "independent" income. Other important institutions include the University of Yarmouk, established in 1976, which has undertaken research in sciences, social science, and engineering, and the University of Mu'ta, established in 1984.

Since the beginning of the 1980s, research planning and coordination have been the responsibility of a Department of Science and Technology in the Ministry of Planning. A priority of the present 5-year plan (1986-90) is that a working group appointed by the Prime Minister propose an appropriate national organization for S&T planning. In addition to providing for increased financial allocations to R&D, the plan also includes as major S&T goals:

- To organize national efforts in the area of social, economic, scientific, and technological information and to develop such information for use in planning;
- To control and organize the process of transfer and import of advanced technology to ensure the transfer of scientific and technical knowledge; and
- To expand cooperation programs and to work for Arab integration in S&T, to increase cooperation with developing and developed countries, and to encourage the establishment of regional and international scientific centres in Jordan.



It has been suggested that a minimum research mass is necessary in agricultural research. Much further work is required on this notion for this minimum will probably vary by kind of research (varietal crop selection, animal disease research, etc.) and be affected by the experience of researchers and their access to external information.

M.E. Piñeiro and E.J. Trigo of the Inter-American Institute for Cooperation on Agriculture (IICA) made estimates for the cost of a minimum module for research on one crop in 1982 and explored some of the implications of this concept. They suggest that a minimum package required annual expenditure of US \$500 000 (90 % operational expenses; 10 % for innovations and equipment). This module included four chief researchers at the MSc or PhD level (3 person years in plant breeding/agronomy and pest and disease control and 1 person year equivalent in socioeconomics and other specializations) with support costs, training, and so on. This cost was then compared to what might be available for research based on a percentage of agricultural production. In comparing this estimate to 1982 budgetary levels for agricultural research, only the larger countries would be in a position to finance a broad coverage (multiproduct) research infrastructure.

They looked at six basic commodities (wheat, rice, corn, potatoes, cassava, and beans) in Latin America and the Caribbean. Using their estimates of minimum annual expenditures, they estimated that the production value of individual crops was high enough to cover the minimum costs in only 40 of 114 possible crops programs if one assumed research expenditures equivalent to 1 % of the crop value. In many cases, research expenditures on a crop are much less than 1 % of the value of production of that crop. Of 17 "small countries," there were only 10 where the minimum research module for even one crop could be justified on the basis of these figures.

Later analysis was undertaken by W.K. Gamble and E.J. Trigo of the International Service for National Agricultural Research (ISNAR) on seven prime crops in 38 small countries in Central America, the Caribbean, and Africa (and presented at a workshop on agricultural research policy and organization in small countries in 1984). By using the same module but varying the costs, they arrived at an annual minimum research expenditure of US \$309 000/crop. They compared this to four different percentages of value of production being allocated to agricultural research: 0.5, 0.75, 1.0 and 2.0 % (Table 4). According to their analysis "in Latin America and the Caribbean, of 102 country-product combinations for maize, rice, cassava, cotton, beans, and potatoes, in only 10 cases is the economic base large enough to support a minimum research effort if 0.5 % of the value of production is spent on research. If expenditures are increased to 0.75 % of production value, 14 cases would be viable, and at 1.0 % (double the actual expenditures for 1980), the minimum research module could be supported in 16 cases."

According to Gamble and Trigo's analysis, "the African situation is not much different. Out of 105 cases covering five products, four combinations are feasible at the 0.5 % level, 10 at 0.75 %, and 11 at 1.0 %. According to these calculations, not one of the countries examined could support sorghum research at the defined minimum level, only one could support maize research, and in two cases a minimum effort in rice would be viable. In cassava, there is a better situation, especially at the 0.5 % and 1.0 % level, where six and seven cases, respectively, are viable."

Admittedly, the concept of a minimum research module is still an artificial construct, and the actual levels required for crop research programs in different countries may vary widely. This kind of analysis does suggest, however,

**Table 4. Country-product combinations (%) generating enough economic value to support a minimum research module, the Caribbean, Central America, and Africa.**

Subregion/country	Maize				Rice				Cassava				Cotton				Beans				Potatoes/ sorghum <sup>a</sup>			
	0.5	0.75	1	2	0.5	0.75	1	2	0.5	0.75	1	2	0.5	0.75	1	2	0.5	0.75	1	2	0.5	0.75	1	2
<b>Caribbean</b>																								
Barbados																								
Cuba				X	X	X	X	X	X		X	X							X					X
Dominican Republic					X	X	X	X										X						
Grenada																								
Guadeloupe																								
Guyana					X	X	X	X																
Haiti				X		X	X	X				X								X				
Jamaica																								
Martinique																								
Trinidad & Tobago																								
<b>Central America</b>																								
Belize																								
Costa Rica					X	X	X	X								X								
El Salvador	X	X	X	X				X					X	X	X	X				X				
Guatemala	X	X	X	X				X					X	X	X	X		X	X	X				
Honduras		X	X	X										X	X	X							X	
Nicaragua				X				X					X	X	X	X		X	X					
Panama					X	X	X	X																
<b>West Africa</b>																								
Benin		X	X	X					X	X	X	X		X	X	X								
Guinea Bissau																								
Equatorial Guinea																								
Gambia																								
Liberia					X	X	X	X			X	X												
Sierra Leone					X	X	X	X																
Togo				X					X	X	X					X	X							
Comoros																								
Cape Verde																								
Reunion																								
<b>East Africa</b>																								
Mauritius																								
Somalia																								X
<b>Central Africa</b>																								
Burundi				X					X	X	X	X												
Gabon																								
Rep. Congo									X	X	X													
Rwanda									X	X	X													
São Tomé																								X
<b>Southern Africa</b>																								
Botswana																								
Namibia																								
Swaziland													X	X	X									
Lesotho																								

Note: X indicates if value is greater than US \$309 000. (1 United States dollar [US \$] = 1.33 Canadian dollars [CA \$].)

Source: Adapted from Gamble, W.K., Trigo, E.J. 1985. Establishing agricultural research policy: problems and alternatives for small countries. In Agricultural research policy and organization in small countries. International Service for National Agricultural Research (ISNAR), The Hague, Netherlands. 41 pp.

<sup>a</sup>Potatoes in Cuba and sorghum in Somalia and São Tomé. Research on beans was not considered for Africa.



## Mauritius

Mauritius is one of the most densely populated countries in the world. In spite of its lack of mineral resources, it has achieved favourable economic results since independence in 1968. Over the 1970–79 period, GNP grew annually in real terms at about 7.5%. In 1979, however, the end of the sugar boom and unfavourable climatic factors plunged the country into a severe economic recession. Corrective measures have had some success, and GNP continued to grow at 3.9% from 1980 to 1985.

Before 1968, Mauritius had almost all the characteristics of a monocrop island economy; its main crop, sugar, occupied 92% of agricultural land, accounted for 40% of its GNP, 82% of its export proceeds, and 40% of employment. Since then, the economy has become more diversified with the introduction and rapid development of new economic activities.

Organized research in Mauritius dates back to the establishment of an agricultural station in 1893 to conduct research on sugarcane and food crops. Sugar research has continued to be a major theme, now conducted by the Mauritius Sugar Industry Research Institute (MSIRI), a parastatal institution created in 1953. Research in fields other than agriculture received less attention before independence, but has seen considerable development since then. New institutions have been created, such as the University of Mauritius, the Mahatma Gandhi Institute, the Mauritius Institute of Education, and, more recently, the Albion Fisheries Research Centre and the Sir Seewoosagur Ramgoolam Medical Research Centre, in addition to research carried out in the various ministries.

There has been no overall research-coordinating agency, although a National Research Council has been considered. A step toward the creation of an overall mechanism has been made with the 1985 establishment of the Food and Agricultural Research Council. Agricultural research is at present carried out independently by three institutions: the Ministry of Agriculture, Fisheries and Natural Resources; MSIRI; and the School of Agriculture of the University of Mauritius.

The creation of the Sir Seewoosagur Ramgoolam Medical Research Centre under the aegis of the University of Mauritius should prove to be a major addition to existing health research activities carried out by the Ministry of Health. Other important areas of research have included energy, requiring the efforts of a number of different institutions; social sciences; and education. One novel feature in social sciences is the recent emergence of some research-oriented NGOs, such as the Institut pour le développement et le progrès, which has studied the socioeconomic environment of fishermen, and the Centre de documentation, de recherches et de formation indianocéaniques (CEDREFI), which has started work on regional cooperation and small planters' involvement in agricultural diversification.

that there are serious issues to be addressed in terms of economic levels of research programs.

The question of economies of scale is linked to the notion of the minimum research module but distinct from it. ("Economies of scale" refers to economies within the research process and to the research cost per unit of production.) In a smaller agricultural research system, research investment per hectare will have

to be higher than in a larger system to achieve equal effectiveness. One review suggested that research is justified only where at least 100 000 ha is devoted in a particular country to the crop concerned. This would automatically exclude 48 developing countries where *total* arable land for all crops is less than 100 000 ha. A United States Agency for International Development (USAID) document discussing countries in Africa on this basis

divided them into “technology generators” and “technology adaptors” where eight countries were in the former (only three with a population under 10 million) and 22 in the latter group.

The level of investment required for agricultural research will also be affected by agroclimatic differences within countries — the cost of developing productive farming systems for a small country with great agroclimatic variations will be greater than for another country with more homogeneity. V.W. Ruttan of the University of Minnesota has also pointed out that a small nation with a strong research program but a limited agricultural or industrial base cannot capture as high a proportion of the benefits from its investment in basic research as can a larger nation with a more diversified economic base.

The foregoing arguments (minimum research mass and economies of scale) concern the level and type of research activity that could be undertaken in a small country. It is clear that, just as in the case for the small countries in the OECD, small developing countries cannot by themselves solve the whole range of problems they face. They must look for ways to tap into external research programs. This requires adequate access to external information. However, even here there are indications of constraints on small countries. Studies suggest that the greater the investment in domestic R&D, the greater the potential for absorbing and utilizing external research. Estimates by R.E. Evenson and Y. Kislev of Yale University indicate that for a low-income country with average research capabilities, an investment of US \$1000 for research performed in other countries located in a similar geographic and climatic zone would produce annual benefits of US \$55000 for the receiving country. If the recipient country had no domestic research capabilities, the annual benefit of the same investment would be only US \$1700. These figures obviously argue for the importance of achieving a

minimum level of investment in agricultural research to ensure ability to benefit from advances in knowledge and technology being generated elsewhere.

## Toward an R&D Strategy

This analysis, although based on assumptions that are complex and controversial, does serve to underline that the capacity of small developing countries to generate the technology and knowledge they require is severely limited. Further work and extension of the analysis to areas other than agriculture is required. The amount of resources that can be devoted to research is limited by size and the importance of overall production. The demands placed on the research system are much less so. The question of size has not often been addressed explicitly in countries’ decisions on their R&D activities. Clearly, it has always been present as an implicit factor in allocating limited funds and trying for the greatest possible effect from these. Some of the key areas that require attention include the following:

### Research or Borrow

Countries have major decisions to make as to what they should attempt to develop with their own research and what can be “borrowed” from external work. This choice suggests that small countries should probably focus on applied research tailored to particular national needs that are not likely to be covered by “importable” research. Clearly, many small countries are already pursuing this strategy. It also emphasizes the importance for these countries to have adequate capacity to undertake policy research to examine their investment decisions in general and, in this case, their S&T or R&D options.

### Concentration

Countries have to consider how many research programs can be supported from the resources available for R&D and whether minimum critical requirements for productive research can be met.



### Benefits from External Research

There are a number of options available to ensure that countries get the most out of research and information available elsewhere:

*What Possible Information* Countries that are severely constrained in their own research require access to good information on activities and, particularly, the products of research undertaken elsewhere. The ability to assess this information for its applicability and usefulness in a particular national context

itself requires considerable training and research experience. Information can be obtained in part through formal information systems, of which a number exist under regional and international auspices, and requires a national ability to access. But information is also available through the “invisible” colleges — researchers exchanging information at conferences, through networks and so on, which requires an active research participation — even if only in a narrow area of a broader field.

### Costa Rica

The Costa Rican economy experienced substantial growth from 1950 to 1979, a period marked by extensive diversification and modernization of the productive sector and institutional development. In 1959, industrial production accounted for 13% of GDP; this rose to 20% by 1975 and 24% in 1986. Costa Rica suffered severely from the recession in 1981 and 1982, part of the “crisis” that forms the background to all discussion of the economic scene of the 1980s in Latin America, and it is now facing the challenge of restructuring and reorienting its economic development.

The area of S&T has been explicitly recognized as having a major contribution to make to development. In 1972, the Consejo Nacional de Investigaciones Científicas y Tecnológicas (CONICIT) was created to promote and coordinate S&T policy. In 1980, a department for this area was added to the Ministry of Planning and Economic Policy and, in 1986, the government created a Ministry of Science and Technology. The national program for S&T, part of the national plan for the period 1986–90, sets goals to enable the country to use scientific and technological development to accelerate export-led economic growth in the next 20 years. These include incentives for productive enterprises to undertake more R&D, which appears to have been limited up to now. The government is also borrowing US \$20 million from the Inter-American Development Bank for S&T expenditure.

A study undertaken in the early 1980s identified 13 institutions involved in research (including universities, a national technology institute, and the ministries of agriculture and health). Research in universities accounted for 47.6% of total funding, government research centres for 42.8%, and private research for 9.6%. Government research played a significant role in agriculture and health. Private research was working primarily in two areas — agriculture and social science. In agriculture, the relationship between research and production is more visible than in other areas. Growers’ associations have, in several cases, decided to set up their own research facilities and programs (e.g., ASBANA in banana production). In other cases, they fund research through government research centres, e.g., the coffee growers through OFICAFE. The government hopes that these close relations between research and production can be encouraged for industry as well.

The Central American region, of which Costa Rica is part, has some experience of regional research institutions. In spite of the major factors limiting the scope and possibility of cooperation in the region, a certain institutional base was established, and three or four institutions, such as the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), are concerned with research.

### *Support from Multilateral*

*Research* There exists a vast array of international and regional institutions that play a role in supporting developing-country research institutions. A survey of these (see *Searching 1985*) showed that they accounted for an annual research budget of more than US \$400 million. Some, such as CATIE in Central America, exist particularly to provide services to a network of national research efforts in small countries. Others have a much wider clientele and may need to be encouraged to work more in support of small-country research (e.g., the institutions of the Consultative Group on International Agricultural Research) (CGIAR). The conclusions of the 1985 CGIAR study of potential address this need explicitly.

### *Support from Other National*

*Research* A number of countries continue to rely heavily on links with countries in the North — often as a continuation of relations established under external support to research. All too often, however, these links do not survive the end of a “project ” under which assistance was granted. There are also enormous, partly untapped, opportunities for South–South collaboration between countries of a similar size through networks and information on

research such as in the Southern African Development Coordination Committee (SADCC) subject networks in Southern Africa. In part, also, these South–South links may be those of smaller countries benefiting from research in larger developing countries facing similar problems.

The limited resources available to small developing countries may make them particularly interested in obtaining external funding from donors for R&D. With heavy reliance on external support for research, small countries risk being vulnerable when donor agencies may, sometimes unconsciously, determine research priorities or at least decide which of a range of priorities actually receives funding.

To alleviate some of these dangers, developing countries, and perhaps small countries in particular, need to have a clear view of the role they expect research to play and the priority areas in which they wish it to be undertaken. Some overall coordination of national research, and of external support to research, seems required. IDRC has tried to be mindful of these problems in contributing to small country research activities. Some recent support to small developing countries is described in the following.



## The Fruits of Research

The International Development Research Centre (IDRC) has been investing in the inventive potential of the Third World for the past 17 years. It has had the pleasure of assisting in the training of thousands of young researchers and has witnessed the production of innumerable scientific articles and reports. Supporting this extremely varied creative effort, in a whole range of situations, has been an immense and exciting responsibility.

IDRC has also been taking another responsibility: seeing to the dissemination and application of the valuable results achieved. A particular variety of plant is found to be drought resistant. A new kind of pump can be installed and kept in repair by the local villagers. Bamboo is used to reinforce mud-brick houses, making them earthquake resistant. It may even be that farmers in the vicinity of the research station have already got their hands on the improved seeds, teams of women from a local nongovernmental organization (NGO) have learned how to make and install the pump, or that the government has introduced new construction standards. That's all very well, but there are millions, tens of millions of families in dire need who sometimes die before the benefits of the improved grain variety, the pump, or the reinforced roof ever reach them.

IDRC has become a master in the dissemination of information to researchers. It has used cooperative networks, computer communications, bulletins, seminars, and specialized information centres. It has also succeeded in focusing the best minds of several countries on specific topics. The dehuller, a mechanical device for removing the unpalatable husk of various food grains, is a good example. The variety of names

under which it appears corresponds to a whole series of models adapted to local needs: the CRS minidehuller in Gambia, the ENDA minidehuller in Zimbabwe, the RIIC dehuller in Botswana, and the SISMAR dehuller in Senegal.

If the head of a research project becomes a government minister, it certainly increases the likelihood that the results will be applied, and that is something that does happen. But not all project leaders rise to such a high level of decision-making. On a more systematic basis, IDRC helps scientists to set up constructive relationships with a variety of people who enhance the value of results: producers' and entrepreneurs' cooperatives, NGOs, and other donors.

IDRC is itself a laboratory for research into the best ways of putting research at the service of development. Today, it approves projects whose legal contracts contain clauses that would not have been necessary at the time it first began making grants. More and more projects now have clauses covering the sharing and use of royalties. Generally, IDRC sees to it that the payments it is entitled to receive are instead used to reduce the costs of products resulting from the research. Some projects include allocations to help small businesses or cooperatives start turning out new products. In the social sciences, researchers engage in systematic dialogue with the media and decision-makers. Finally, IDRC is working increasingly closely with other donors and institutions that can collaborate in financing pilot plants and then take over to fund large-scale operations for the adoption of new technologies.

This edition of *Searching* briefly describes some of the research projects for which IDRC approved funding last year. In keeping with the theme of small

countries, part of this section covers research activities in countries with less than 10 million people, and another section describes those projects in the larger countries that were approved by IDRC in 1987.

## Support for Small Countries

Every year, IDRC finances a large number of research activities in countries with less than 10 million people. In Africa, which is a priority region, more than half the countries fall into this category. All of the Central American countries except for Guatemala have less than 5 million people. Numerous newly independent countries in the Caribbean and the South Pacific have added dozens of microstates to the Third World. Even in Asia, Bhutan and Laos are among the developing countries that can be classified as small.

### How Refugees Settle In

Mozambique, Tanzania, Kenya, Ethiopia, and Sudan form a chain of contiguous East African countries, each with more than 10 million people. The extreme eastern horn of the continent, however, is occupied by a geographically large arid country with less than 6 million people: Somalia.

A dramatic example of the drastic fluctuations that can occur in a small country, Somalia has experienced a 20% increase in population in the past decade. Since 1977, 1 million refugees have chosen to migrate there.

The country is poor, 25% of the children die before the age of 5, and only 13% of its land can be cultivated. The presence of 1 million refugees in need of emergency assistance constitutes a major problem. Grain has to be imported to feed these people, who are allowed to cultivate only small plots. This adds to the foreign debt. The demand for firewood has led to the disappearance of all the trees within 40 km of the oldest camps. Overgrazing by the refugees' herds, which are increasing, may well do irreversible

ecological damage. Huge numbers of plastic buckets and shoes that were given to the refugees have been resold in local markets and have destroyed artisanal manufacturing. Along with these problems, camps located near the principal cities are turning into suburbs, and certain small towns would disappear if the refugees were to go home.

An inquiry into the socioeconomic integration of refugees and their interaction with local communities has become absolutely essential now that the Somali government has accepted that these foreigners aren't likely to go away soon. IDRC's Board of Governors agreed to finance such an inquiry and it will be carried out by Haqabtir, a Somali NGO specializing in assisting refugees. The results should increase the likelihood of the government basing its policies on knowledge of the actual situation of displaced people rather than on unfounded speculation.

This research is part of a series of IDRC-supported studies on refugees in Thailand, Botswana, Lesotho, Swaziland, and Tanzania. Last year, IDRC also undertook to support an in-depth study of conditions created for the million people whom the Ethiopian government resettled in the south of the country during the 1983–85 drought.

### Precambrian Water

None of the countries immediately to the south of the Sahara Desert, referred to as the countries of the Sahel, has more than 10 million people. Like the others, Mali has been severely affected by drought. Even in normal times, only 8% of the population gets its potable water from pumps. AMRAD, a Malian NGO, will test a plastic manual pump developed by an IDRC-funded research program in Africa and Asia.

Before the 47 shallow-well pumps imported from Malaysia are installed, the head of the project and two AMRAD technicians will go for training in Kuala Lumpur, the capital of Malaysia. Although



the Tombouctou area of Mali where the pumps are to be tested has been harshly afflicted by drought, water can be found quite close to the surface there because of the proximity of the Niger River. In neighbouring southwest Niger and in 80% of Burkina Faso, on the other hand, deep wells have to be drilled. This is done in the African precambrian bedrock whose cracks are often full of water. Each borehole, however, costs about \$10 000. In collaboration with the University of Quebec in Chicoutimi and Montreal, researchers from Burkina Faso and Niger will take samples from existing boreholes and analyze the geological environment to determine the characteristics of high-flow boreholes. The results of these studies should make it easier to identify the best drilling sites, thereby saving millions of dollars.

### **The Systems Approach**

During the droughts of the 1970s and 1980s, the small countries of the Sahel

were threatened by a serious loss of their territory to the encroaching desert. Some of them considered quite simply giving up enormous areas. Others tried to make the desert flower again. Still others tried to build up their more climatically reliable areas, as in the case of southern Mali.

Last year, IDRC renewed its support for the development of new cropping systems for the farmers of southern Mali. Since 1979, a team from Mali's Ministry of Agriculture has been working in three villages: Gladié, Monzondougou, and Sakoro. Here they train Malian experts in what is referred to as the "systems approach" to research on agricultural production systems.

With the systems approach, agriculture is viewed as a whole. Specialists in the field begin by studying the full range of activities of a group of farmers. Using what they know about the small farm environment, they make diagnoses and identify any production



*A sure sign of improvement of a farmer in south Mali: a powerful team of traction animals.*

constraints. Then they work with the farmers on their small plots and test out new packages of agricultural methods.

In the poor village of Sakoro, Malian specialists using the systems approach have been able to increase corn production from 0.5 to 2.5 t/ha. As late as 1980, the village had no draft animals, manure, or fertilizers, and produced no cotton, a crop capable of generating income for the purchase of oxen or fertilizers. By 1985–86, more than a third of the farmers owned a pair of oxen. Together with experts working on a research project into the use of local fertilizer resources, the Malian team also demonstrated the effectiveness of natural phosphates, among others, in growing cowpeas. This enabled farmers to earn more from better fed animals.

Increased incomes in the three pilot villages that participated in the farming systems research program in southern Mali have encouraged neighbouring villages to adopt the same systems. This useful research is only one of numerous activities funded by IDRC and coordinated by the Réseau d'étude des systèmes de production en Afrique de l'Ouest (RESPAO) at Ouagadougou, Burkina Faso. Last year, IDRC also agreed to fund the network's coordinating office and information system there. The network also disseminates to several small countries research results from the important International Institute of Tropical Agriculture (IITA), located in nearby Nigeria. Thanks to several networks of research projects, IDRC contributes in the disseminating of results to small countries from the international research centres and large countries such as Nigeria and China.

### **A Boost for Entrepreneurs**

Halfway through last year, IDRC agreed to fund the information and documentation service of the Fédération des Chambres de commerce de l'Afrique centrale (FCCAC), based in Brazzaville, Congo. The federation brings together the

11 countries of Central Africa, three of which have fewer than 1 million inhabitants: São Tomé and Príncipe (108 000), Equatorial Guinea (373 000), and Gabon (997 000). The information bulletin, lists, and technological bibliographies that it has already made available will enable the 11 320 commercial interests (such as companies and cooperatives) listed as active in the region to gain access to various kinds of information essential to commercial enterprises, especially agroindustry.

The all-too-few African entrepreneurs upon whom several countries are basing their development strategies need the support of competent staff. In Abidjan, the Centre interafricain pour le développement de la formation professionnelle (CIADFOR) has received IDRC support to establish a network for gathering information on the experiences of West Africa's 19 French-speaking countries in the field of vocational training. Only three of them have more than 10 million inhabitants. The network will enable employers' and workers' organizations to mobilize African resources for the training of personnel in industry, trade, the hotel business, and agroindustry.

### **Processing Grain Mechanically**

In the West African country of Gambia, a small country with a population of 748 000, artisans have begun building dehullers for millet and sorghum. To begin with, they were sent a prototype from Canada. They modified it and produced a dozen. One of these was sold to an entrepreneur whose mill did so well that he now wants to buy a second.

The IDRC Board of Governors supported this experiment in the introduction of technology by authorizing a project for the construction and installation of 13 other minidehullers, run by Catholic Relief Services (CRS), an NGO. Three different workshops will do the manufacturing. CRS staff will conduct a careful study of the operation and



profitability of the 13 minidehullers, each of which will be installed in a different small mill. The experiment has the support of the Women's Bureau of the Gambian government, which has already set up about 20 mills.

At the same time, the Institute for the Study and Application of Integrated Development (ISAID), a Canadian NGO, will install three Gambian-made minidehullers in mills in Niger. (The community-built mills are located in one small town and two villages.) The head of the ISAID project is a Canadian. She has worked closely with the multidisciplinary team in the town of Filingué where the first minidehuller will be set up. Researchers have identified grain dehulling as the bottleneck in food production. In 1982 in Niger, there were 1430 grain mills, but not a single dehuller.

#### Dehulling and Self-Sufficiency

With a population of only 1.1 million, the Southern African nation of Botswana now relies on a number of local mills to produce sorghum flour. This has reduced its dependence on imports of processed grains from South Africa. A basic element of each of these mills is one or more large-capacity dehullers. This small country has acquired such a mastery of dehuller manufacture that it has been exporting the machines to several other surrounding countries, including Zimbabwe.

Zimbabwe is also well able to manufacture dehullers, specifically minidehullers. Last year, IDRC made a final grant to an NGO, ENDA-Zimbabwe, before the Canadian International Development Agency (CIDA) began the funding of a large-scale operation for disseminating dehuller technology through 40 mills. The dehuller will also make an appearance in Zambia where the Small Industries Development Organization (SIDO) will install it in three community mills. In Tanzania, an organization by the same name has already demonstrated the profitability of the dehuller in a number of

mills. Tanzania's SIDO has also received IDRC funding to produce instruction manuals in Swahili. The hope is that these will considerably increase the machine's appeal to entrepreneurs and consumers.

#### Mothers and Researchers

The South Pacific is dotted with microstates whose populations are distributed among a number of small islands. Some of the large Southeast Asian states also include thousands of isolated island communities. The women on several of these islands are not yet aware of it, but they will soon be in possession of a tool that has transformed other parts of the world. This gift, which is being arranged for them by six teams of academics and government officials, is not something they specifically requested.

Coordinated by a demographer from Singapore and an anthropologist from Malaysia, teams in Fiji, Malaysia, Papua New Guinea, the Philippines, Western Samoa, and Thailand will attempt to pass on the methodology of scientific research to the women. Research professionals have broken down the scientific method into a series of steps for the women to follow.

First, the researchers will study the characteristics of the communities. Then, on their first field visit, they will help the village women to identify from 6 to 10 among themselves to take on responsibility for research. These villager-researchers will agree upon how to proceed after 3 or 4 days' training in data collection and analysis. Each team will carry out surveys of local health conditions while the research professional provides support and guidance. The results of the work of several teams will then be presented in the form of tables and diagrams and shared at a national workshop.

Halfway through the 3-year project, which IDRC approved in 1987, the professional researchers guiding the women will meet to formulate general principles based on the decision-making

process and health priorities of the village women. They will then return the overall results to the women so that they can select the best health strategies for themselves. In the end, the people will have better health services and the professional scientists will have a new methodology for participatory research. Subsequently, this methodology can be used to promote health-related innovations in thousands of island communities.

### **Cooperative Debt Management**

Next to the South Pacific in its wealth of microstates comes the Caribbean. In the north are the Greater Antilles: Cuba, Jamaica, the Dominican Republic, and Haiti. Of these, only Cuba has more than 10 million people. To the southeast are the Lesser Antilles; several still belong to other countries, but a great many of them have become independent in recent years. Seven of them, with populations ranging from 12 000 to 136 000, share a common currency, the Eastern Caribbean dollar, managed by the Eastern Caribbean Central Bank (ECCB). Each of these islands has obtained from 70 to 80 loans all of which have to be repaid. The management of these debts is not centralized and it is difficult for the ECCB to know exactly what is going on with the regional debt.

In 1986, the debt managers of the seven ECCB members (Antigua and Barbuda, St Christopher-Nevis, St Lucia, Dominica, Grenada, St Vincent and the Grenadines, and Montserrat) learned of a debt management system, CS/DRMS, developed by IDRC and the Commonwealth Fund for Technical Cooperation (CFTC). CS/DRMS computerizes the management and analysis of the national debt. It makes it possible to plan loan payments day by day, issue the payments, and determine future foreign currency needs. The program runs on a microcomputer and is supplied free of charge to members of the Commonwealth. To help the seven islands put this system in place, IDRC

provided funds to purchase the microcomputers and to help train personnel.

### **Income from Oysters**

In Jamaica, the smallest of the Greater Antilles, IDRC has renewed its support for an oyster culture project so successful that there are now fears the increase in production will depress prices. Some 10 entrepreneurs have adopted the technique developed by the Ministry of Agriculture. There are still, however, serious problems to be tackled. The mortality among oyster larvae, for example, is too high and threatens the profitability of the operations.

Be that as it may, there is now a system for oyster farming and a number of people are anxious to get into the oyster farming business. This new phase of the project affords the Ministry of Agriculture an exceptional opportunity to transfer technology to cooperatives and entrepreneurs. It includes a small fund for granting loans to new oyster farmers.

Old tires and bamboo stalks have been installed in the water for the oysters to cling to. To the great joy of fishermen, fish have returned in great numbers to these places. Plans are also being made to introduce the cultivation of sea moss, based on a system developed in another IDRC-supported project on the island of St Lucia in the Lesser Antilles. All in all, a new marine environment is taking form on the coasts of Jamaica. The government is already thinking of it as an export industry that can provide Jamaicans with jobs of a different kind than the large number provided by the tourist hotels.

### **Farming Suited to Each Hill**

Whether it be on Jamaican hillsides or the western Canadian prairies, the price of viable agriculture is constant adaptation. Unforeseeable genetic mutations create new breeds of insect pests, contaminated matter introduces unknown diseases, and the demand for a crop collapses. No production system is good for all time. Nowadays, if



production systems are to be constantly adapted, they need the backing of research and that research must be targeted on farms.

In the course of research into production systems on 2500 farms in the Guy's Hill and Watermount regions on the western tip of Jamaica, researchers have already produced varieties of vegetables with a higher yield. They have also demonstrated that the introduction of fruit trees stabilizes the soil on the hillsides. Much of their success results from their open-mindedness in allowing themselves to be guided by the farmers on the question of which crop combinations or sequences are worth retaining. IDRC will continue to support their work on developing systems for use by hillside farmers that combine grains, vegetables, and trees.

Similarly, on the other side of the Caribbean, in Costa Rica, scientists from the University of San José will experiment

with various systems that combine crops, trees, and livestock. Their introduction will be suggested to 2500 families settled on new land in the north of this small Central American country. The Jamaican and Costa Rican researchers will have the opportunity to collaborate with IDRC-supported production systems specialists in other countries of the region.

### **Biological Control**

Costa Rica is one in a chain of seven small countries that link North and South America. A number of them are experiencing severe social tensions and even armed conflict. This does not stop research, but neither does it help it.

In Nicaragua, immediately to the North of Costa Rica, biochemists have already begun using *Bacillus thuringiensis* (Bt) bacteria to combat pests that destroy corn and vegetables. In 1986, Nicaraguan agricultural producers used 280 t of Bt, half of it imported. Current demand is, however, 1400 t. It also seems that the



*In Jamaica, entrepreneurs and cooperatives are now eager to get into oyster culture, using an economical technology package developed with IDRC support.*

type of Bt imported is not fully adequate and that its efficiency in a hot humid climate cannot be guaranteed. IDRC has, therefore, given its support to a joint research project involving Canadian biochemists at the University of Western Ontario and Mexican specialists from the Centro de Investigación y Estudios Avanzados del Instituto Politécnico Nacional to help Nicaragua identify the most useful breeds of Bt and develop methods for the industrial production of this living insecticide. A consortium of Canadian NGOs, guided by Inter-Pares, has undertaken to fund a factory for the production of Bt in Nicaragua when that stage is reached.

### **Agriculture in a State of Shock**

In South America, the only countries with populations of less than 10 million — Bolivia, Ecuador, Paraguay, and Uruguay — run in a chain from the northwest to the southeast of the continent. In Paraguay, which has long been an isolated enclave both politically and geographically, more than half the labour force works in farming. In the 1960s and 1970s, its agricultural sector had the highest rate of growth in Latin America. Soybean production, for example, went from 10 000 t in 1967 to more than 700 000 t in 1977. Strong international demand, easy credit, an enormous program that distributed land to 80 000 families, and the clearing of large Brazilian-owned farms all fueled this explosive growth.

Then, in the early 1980s, crisis struck. Collapsing prices coincided with an increase in production costs, a reduction of credit, the suspension of land distribution, and the impoverishment of the new land.

More than half the agricultural enterprises in the country have less than 10 ha of land and the small-scale farmers are unable to cope with this situation. Things were made even worse because, as researchers at the Centro Paraguayo de Estudios Sociológicos showed, state policies failed altogether to meet the

farmers' needs. This research, which IDRC's Board of Governors has agreed to continue supporting, will enable a large group of NGOs, cooperatives, and producers' associations to work closely with government officials in formulating policies better adapted to the present context. A similar project in neighbouring Uruguay, which is also in the throes of a severe economic depression, deals with rice and wheat, products for which the market is stagnant.

The following section covers some of the research projects IDRC agreed to support in 1987 in countries with populations of more than 10 million. The range of problems and, fortunately, of results is on a par with the size of the countries concerned.

### **Solutions to Match Problems**

Although many small countries are having serious difficulty in paying back their foreign debt, one hears much more about the problems of the larger countries, but that is hardly surprising. The three largest countries in Latin America — Argentina, Brazil, and Mexico — account for 25% of Third World debt.

#### **Economists for the People**

Economists in Argentina, Brazil, and Peru came up with novel plans to combat inflation: the Austral, Inti, and Cruzado plans. The Cruzado Plan is in ruins, victim to the hesitations of the politicians involved. The Inti Plan has been swept away by the convulsions shaking Peru. In Argentina, the Austral Plan has broken the back of inertial inflation (that part of inflation attributable to an inflationary psychology), but structural inflation, caused by intrinsic deficiencies in the economy, persists. IDRC supported several of the economists who designed these plans.

There is a great deal to be learned from these experiments and they continue to be studied. But no one any longer supposes that there can be a rapid, painless remedy. If they are to recover,



the economies of Latin America will have to go through painful restructuring based on social consensus. Such a consensus can only come from national discussion drawing upon original ideas. For a number of years, IDRC has supported the efforts of numerous local economists to come up with constructive ideas. Last year, it continued its support for the work of several groups of economists based in universities or independent institutes. Two such groups, the Corporación de Investigaciones Económicas para Latinoamérica (CIEPLAN) in Chile and the Group of Analysis for Development (GRADE) in Peru, are active in disseminating the results of their work and encouraging national discussion. CIEPLAN, which has been called the most important political economy research institute in Latin America, if not in the Third World, has instituted a running dialogue with the economic press in the form of a continuous seminar on popular economic journalism. Members of CIEPLAN travel around Chile to speak with entrepreneurs, peasants, and workers. They have recorded economic discussions on video cassettes that circulate throughout the country outside the official channels. Each month, the ideas of the CIEPLAN researchers are also put before the Chilean and Latin American public in the form of newspaper and magazine articles.

IDRC will maintain its support for several other economic research programs in Bolivia, Colombia, Costa Rica, and Nicaragua. It has also taken a leadership role in the creation of a major program to support economic research in sub-Saharan Africa. The program allows for meetings and exchanges with Latin American economists.

### **Job Creation**

Along with debt, one of the biggest concerns of Third World countries continues to be job creation. Things could hardly be otherwise in countries where 40–45% of the population is under the age of 15.

This creation of new jobs must occur at a time when industrialization requires countries to take an increasingly difficult leap forward, but creates almost no employment. One route that has long been taken is the local manufacture of previously imported products — import substitution. This approach also enhances the value of resources unique to the countries of the South. Peru, for example, has several sources of important natural colorants. These include cochineal, a superb carmine (red) colorant made from insects that feed on cactus.

In 1986, IDRC funded joint research by Simon Fraser University in British Columbia and the Instituto de Investigación Tecnológica Industrial y de Normas Técnicas (ITINTEC) to improve the rate of extraction of carmine dye from cochineal. Rates as high as 25% have been attained, but in Peruvian enterprises it is only 15%. A new grant from IDRC will allow construction of a pilot plant that uses the new procedure. The new technology will be transferred to industry by putting the plant up for auction. This should enable the funding agencies to get back some of the money committed. Similar joint research on textile dyes will be done by Sherbrooke University and the Pakistan Council of Scientific and Industrial Research (PCSIR).

A project involving the development of microprocessors for the digital control of machine tools may well turn the Institut d'ordinique du Québec (IOQ) into a research centre specializing in the development of industrial systems based on microprocessors. Its partner is an industrial research company, PACE, in Hyderabad, India. There are even plans for an association between the Fondation IOQ (a nonprofit organization) and PACE to manufacture and market electronic modules designed to resist sudden drops in voltage and dusty or humid environments.

Not all research projects linking Canadian specialists and their Third World colleagues involve royalties

payable to IDRC. In Peru, for example, IDRC-supported research has already found ways of making houses built of adobe (dried earth bricks) far more resistant to earthquakes. Last year, IDRC made another grant to Peru to improve traditional quinchas, usually built of bamboo plastered with dried mud. The Canadian partner of the Pontificia Universidad Católica, in Lima, is the Technical University of Nova Scotia, in Halifax.

### The Multiplier Effect

One of IDRC's criteria for funding is the regionalization and internationalization of the research results. IDRC prefers to select projects whose results could be useful to several countries. In the case of China, this effort to multiply the benefits takes on its full force. This is why a large share of the research funded in China is approached from an international angle. In fact, IDRC is helping China to help other developing countries.

At the beginning of 1988, China will inaugurate a completely new Sino-Canadian Mariculture Research and Training Centre at Qingdao on the coast of the Yellow Sea. The ancient Chinese science of raising ocean fish in captivity will be developed there and the institution will take in students from developing countries. China is extremely proud of this trilateral North-South-South operation that allows it to advance scientifically at the same time it helps other countries.

The raising of giant prawns and mullet has been practiced extremely intensively in tens of thousands of hectares of pens on the shores of the Yellow Sea and the China Sea. Moreover, there has been explosive growth in the farming of "haidai," marine algae used as a food. It seems, however, that the limits of the mariculture systems have been reached and losses caused by various diseases are increasingly serious. The Chinese specialists hope to restart mariculture on a new basis by combining algae farming with shellfish culture. This

new marine polyculture will create a more balanced marine environment that, in turn, will decrease the risk of shattering epidemics that occur when too many individuals of the same species are crowded together.

The funding authorized by IDRC's Board of Governors will contribute to new patterns of marine polyculture. At the same time, funds have been allocated for the production of instructional materials and to introduce teaching staff to modern teaching methods.

IDRC-China research cooperation is producing excellent results in the area of fisheries. These include the development of a drug-hormone kit used to induce several species of fish, mainly carp, to breed, thereby improving the reliability and quantity of the supply of fry for fish farming. The technology is already marketed in Canada by Syndel Laboratories, in Vancouver, and talks are under way to have the kit manufactured and sold in China by the Chinese Ningpo Fish Hormone Factory. IDRC has renewed its support for this research that links the work of specialists at the University of Guelph in Ontario, the University of Alberta, and Zhongshan University, this time in an effort to find out how to accelerate the growth in weight of fish by stimulating the secretion of growth hormone.

Throughout Southeast Asia, aquaculture research is expanding rapidly and IDRC's contributions to a number of countries have been considerable. Among the projects supported in 1987, IDRC increased its assistance to the Asian Fisheries Society based in Manila, the Philippines. A significant grant will enable the Society to fund the work of 30 young researchers from the region.

### Fish and Rice

In Thailand, it is the scientists who, at present, are being led by the farmers. For more than two centuries, Thai rice growers raised fish in the flooded paddies. But then new varieties of rice were introduced that had to be sprayed with





*In Thailand, an increasing number of farmers are raising tilapia, the aquatic equivalent of chicken.*

pesticides to keep their promise of high yields. This led to the disappearance of the rice-fish association. Now, however, fish are again showing up in increasing numbers in the paddies of northeast Thailand. The farmers of the region are the poorest in the country, and they decided on their own to reintroduce the combined cultivation of rice and fish because they used only small quantities of pesticide. A team from the Ministry of Agriculture is conducting a detailed study of farmers' practices. The preliminary results indicate that fish protect rice against disease and pests, and those who grow rice and fish together earn from 50 to 100% more. Dissemination of the rice-fish production system is already being supported by a Canadian NGO, CUSO, and CIDA. The IDRC-supported research project should help to facilitate this activity.

#### **Canada Benefits Too**

Some of the IDRC-funded research that links Canadian and Third World

researchers leads to a mutually profitable exchange. Last year, IDRC renewed its support to a major program for the improvement of rapeseed, carried on jointly by the Canadian and Chinese ministries of agriculture. In an initial phase, Chinese growers managed rapidly to adopt Canadian-developed varieties, called Canola, which are low in erucic acid (harmful to human beings). One of the priorities of the second phase is to collect native Chinese varieties, which are threatened with disappearance by the rapid adoption of Canadian varieties. The susceptibility of rapeseed to disease continues to be high, and Canadian producers might one day benefit from the introduction of Chinese genetic material. IDRC is also supporting exchanges between researchers from the two largest rapeseed producers (China and Canada) and those in Egypt, Ethiopia, India, Pakistan, and Sri Lanka — all of them countries in which it supports research into other oilseed plants such as soy, sunflower, and sesame.



## Wheat and Trees

Another gift that China might eventually make to the world is the Paulownia tree. In just one decade, this fast-growing tree has been planted on 1.5 million ha of arable land in China. Planted in rows in wheat fields, this multipurpose tree increases the yield of wheat by as much as 23%, provides leaves that can be fed to cattle, enriches the soil, and supplies wood. The danger with the popular Paulownia is that it may end up being the only major agroforestry system in China.

Last year, IDRC renewed its support to the Chinese Academy of Forestry, the institution carrying out this research whose results are already benefiting many thousands of farmers. IDRC has also provided funding for courses on Paulownia farm forestry for African, Asian, and Latin American foresters. IDRC staff believe that the introduction of this Chinese tree into Latin America could be highly beneficial. Those attending the courses were also given information about the most recent results achieved by Chinese experts in bamboo research. Bamboo has fed and sheltered people in tropical countries for thousands of years. Last year, to help the Chinese Academy of Forestry disseminate its results, IDRC granted it funds to establish an information centre in Beijing for disseminating world wide the most recent research results on bamboo. Among numerous grants to specialized information centres, IDRC also renewed its support for the International Buffalo Information Centre at Kasetsart University in Bangkok and to the International Network for the Improvement of Banana and Plantain, a decentralized research structure represented on every continent.

## Telematic NGOs

It is technically feasible to link up Third World NGOs by computer. It can be done by people who know nothing about computers and the cost is reasonable. Several NGOs are already

equipped with microcomputers and the notion of interconnecting them is catching on fast in numerous developing countries.

That is the main conclusion drawn from an experiment conducted by the Instituto Latinoamericano de Estudios Transnacionales (ILET), a Latin American NGO based in Santiago, Chile, with offices in Mexico and Buenos Aires. IDRC has agreed to support the work for a further 2 years. The experimental project also demonstrated that it was possible to coordinate the activities of NGOs based in different countries. All of this can be done while achieving substantial economies in telephone charges. In the next phase, ILET will test new telecommunications software and develop training programs in telematics techniques. ILET's Mexican office will also use the experience acquired to promote the use of Mexican data banks and networks.

In fact, many Mexican customers of foreign data banks fail to use the data banks already in place there or don't know of their existence. This leads to a waste of foreign currency. Moreover, identifying a document in a data bank outside the country in no way guarantees obtaining the whole document. This national project will provide ILET with information that can then be used to facilitate the increased usage and eventual expansion of Mexican information and communication resources.

## Marketing the Results

Despite the growing role of computerized networks in the dissemination of scientific and technical information, paper documents are still the major repository of results and are the preferred medium of communication by researchers. Last year, IDRC participated in the training of those responsible for producing scientific and technical publications in Asia and North Africa. It is also helping to support the production of a whole range of vehicles for the dissemination of research results: films, videos, bulletins, pamphlets, and posters.





*Research funded by IDRC has demonstrated that people better than doctors alone can improve the health status of communities.*

Sometimes these are produced as complements to an instruction manual, a training course, and a specialized telematic network to answer users' questions rapidly, all this being part of global marketing operations, such as the one for the polyvinyl chloride (PVC) handpump.

#### *Priming the PVC Pump*

In 1987, CIDA combined forces with IDRC to disseminate a simple, inexpensive water pump, developed over 11 years in a series of IDRC-funded projects. The central element in efforts to manufacture, promote, and disseminate the pump will be a completely new centre for research and training in handpump technology at the University of Malaya in Kuala Lumpur, Malaysia.

Projects in previous phases in Asia and East Africa have confirmed that the pump can be manufactured in developing

countries using PVC plastic, the kind now widely used in household plumbing.

The PVC pump has been adapted to the different contexts of 11 Asian and African countries. It has been demonstrated that village people can install and maintain it. What has to be done now is to disseminate it among the millions of Third World families who still don't have potable water.

The dissemination strategy that IDRC and CIDA have decided to support is based on training future manufacturers of the pump at the University of Malaya centre. Third World entrepreneurs and NGOs will be invited to obtain manufacturing licences from this centre of excellence in handpump technology, which will be responsible for the worldwide dissemination of the pump.

The end result of this project will be the complete appropriation of the research, manufacture, and marketing of



the pump by the Third World. If it is successful, the project will serve as a model of technological innovation in developing countries.

In addition to the establishment of the handpump centre in Kuala Lumpur, IDRC agreed last year to fund an important experiment in the manufacture and marketing of the handpump by an NGO in Sri Lanka. Again, CIDA is IDRC's partner in this project in which the manufacture and installation will be done by women. In China and Kenya, two experiments in the use of a version of the pump for deep wells (30–40 m) have also been funded. These two countries will benefit from the assistance of Malaysian experts before they, in turn, become centres for the dissemination of plastic handpump technology.

### **AIDS Children**

In Africa, AIDS afflicts women as well as men and, as a result, also strikes babies. Epidemiological studies show that as many as 20% of the population in some regions of Africa carry the AIDS virus. It is now thought that as many as 10% of children will be born already infected by this deadly disease, and what if those who are spared at birth become infected through their mother's milk?

Two projects funded by IDRC in 1987 are designed to elucidate how transmission from mother to infant occurs. The first study will be done in Kenya based on a sample of 100 mothers infected with HIV, the AIDS virus. The mothers were recruited from a hospital where 3% of women delivering babies are carriers. The other study will be done in Uganda where the situation is quite simply catastrophic. In a sample of 1000 pregnant women, 137 were HIV positive. IDRC has also granted funds for the development of an AIDS diagnostic kit by a U.S.-based NGO directed by a Canadian, the Program for Appropriate Technology in Health (PATH).

The Fifth International Conference on AIDS will also draw upon IDRC expertise. The Canadian government has entrusted

IDRC with the organization of the conference, to be held in Montreal in June 1989. More than 10 000 participants are expected to attend.

Because of AIDS, many lives will depend upon the success of information campaigns in changing people's behaviour. In the Third World, more than elsewhere, the successful mobilization of the community can achieve more than any technology or machine. This is true not only in the health sector but in many areas.

Last year, IDRC renewed its funding for several projects aimed at developing preventive campaigns with community participation. Some of these projects — such as one on the transmission of two parasitic worms, ankylostoma and ascaris, conducted by Gadjah Mada University in Jogjakarta, Indonesia, and one dealing with a liver parasite at Mahidol University, Bangkok, Thailand — have already involved mobilizing the local population. Community involvement enabled the doctor in charge of the Indonesian project to reach the conclusion that mass chemotherapy, the improvement of health facilities, and education were far more effective in reducing reinfection rates than mass chemotherapy alone. There needs to be follow-up to ascertain how best to ensure the maintenance of good habits.

Whether in health, agriculture, or economics, the hundreds of projects funded annually by IDRC can only achieve their objectives if the target populations feel that the results belong to them. This takes on even greater significance if one realizes that the potential users of this research have little or no income. In pursuit of this goal, IDRC projects increasingly get scientists involved with the local population. In a certain sense, IDRC is the partner, not only of the thousands of scientists who are its immediate associates, but also of the poverty-stricken millions of the Third World who cling to their belief in a better future.



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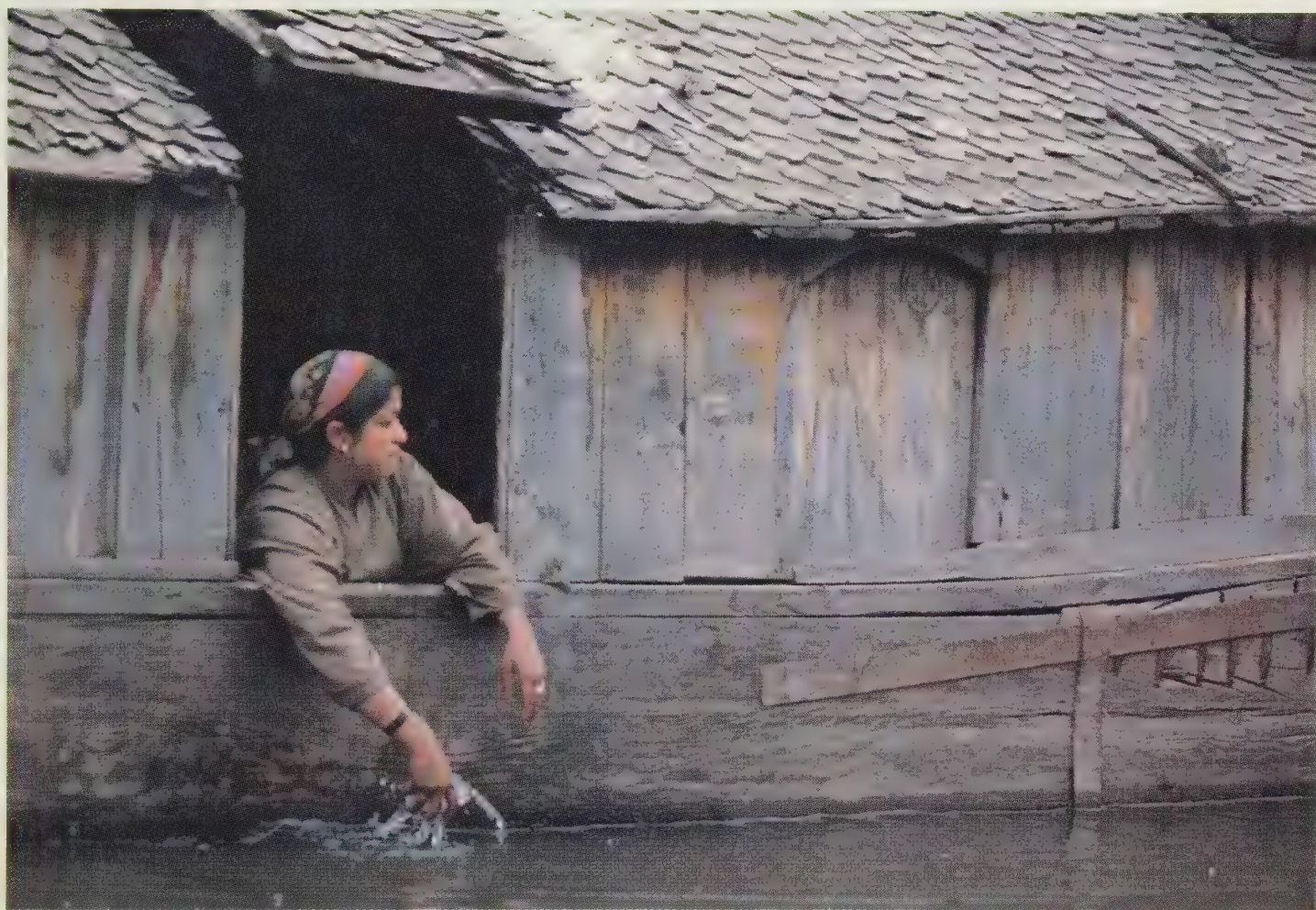
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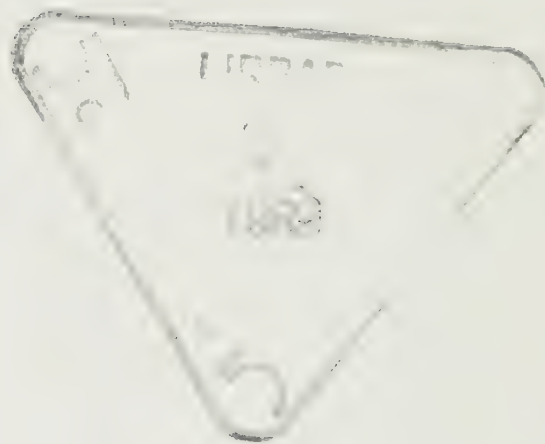


Fresh Water

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The Human Imperative





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*All photos are by IDRC staff except as noted.  
Front cover: Life on the canals in Srinagar, India.  
Back cover: The Sarvodaya Movement in Sri Lanka trains young women  
to manufacture, install, and maintain handpumps.*



## Fresh Water: the Human Imperative

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# INTRODUCTION

The ancients revered water. In the age of innocence, earth, air, fire, and water were regarded as the four constituent elements. Mythology lent to them a richness of character and a range of mysterious attributes. During the intervening millennia, human settlements, human activities, and human festivals have all reflected the central role of fresh water.

Today, in the age of science, myths and mysteries are not in vogue. Neither, seemingly, is respect for water. Human indifference, human ignorance, and human greed combine globally to waste it, foul it, and divert it, thereby denying it to neighbours. There is probably no other commodity so treasured by some, while regarded with such indifference by others. International law, justice, and common sense all demand responsibility of the upstream actor. In terms of both quality and volume, persons downstream are entitled to be protected from despoliation and diversion. Yet poisonous wastes are dumped, sometimes into rivers and lakes, sometimes into the atmosphere, where they can cause acid rain, as if wholesome water is of no value and poison of no consequence. Destructive upstream activities, however, are not confined to water. Interference with normal catchment areas occurs all too frequently and broadly. Streams become destructive torrents.

Thus are the ancient natural cycles of rain and drought, providence and famine, and health and pestilence complicated and compounded by modern human activity. In these instances, there are limits to the compensating effectiveness of science and technology. Techniques may be refined for the conservation of water, for the recycling or disposal of wastes, and for the design of efficient handpumps. However, without an



*Students from the Kakuyuni Primary School in Kenya are proud to explain to IDRC's President, Ivan L. Head, how they distributed 5000 seedlings as part of a local forestry project.*



understanding of the need for their application, resources for their broad utilization, and a commitment by governments to wise policies, neither knowledge nor technology will be adequate.

The following pages are dedicated to water. The discussions of water-related issues are much broader, however, than the substance itself. Human attitudes, human knowledge, and human behaviour are regarded by the International Development Research Centre (IDRC) as ingredients central to any amelioration of water-related problems. In some instances, these characteristics may be better understood through sound research. In others, one can only hope that human beings will once more come to regard water with the respect shown it by societies in centuries past. In that regard, sadly, science and technology has been a negative influence. The incorrect assumption that science alone can overcome all problems has diminished the human race's earlier sense of humility and frailty and replaced it all too often with an entirely unjustified belief in its superiority.

Earth, air, fire, and water are as representative of the natural environment today as they were in prehistory. The Brundtland Commission has emphasized as sternly as any ancient gods that the very survival of the human race is dependent upon a wise stewardship of that environment.

In recent months, the Chairman of the Brundtland Commission transferred to IDRC all the original Commission archives. The Centre's library has assumed responsibility for the preservation and management of this important material. The information there recorded will encourage the Centre and direct its efforts. From the Commission's report, we trust, will come the stimulus to employ science and technology wisely and, in doing so, to live in balance with the world's water resources.

*Ivan L. Head*  
*President, IDRC*

# THE GLOBAL SUPPLY

Next to oxygen, fresh water is the most important substance for sustaining human life. Without it, people cannot survive more than about 3 days. Water accounts for 67% of human body weight and 90% of body volume.

Only 3% of the world's total water supply is fresh water; the rest is seawater. Much of the world's fresh water exists as glaciers and polar ice, sources that are largely unavailable for human use — the exception is the Inuit who cuts ice from a coastal iceberg and carts it home by snowmobile to be melted for drinking water. Similarly, much of the world's groundwater is locked away in deep rock formations, out of the reach of conventional human technology.

Although it makes up only a tiny fraction of the world's water, the planetary supply of accessible fresh water is more than enough to sustain the growing world population, which stood at 5.1 billion in November 1988. The problem for villagers, city dwellers, governments, and development agencies is to deliver this fresh water where it is needed, at an affordable price, and without degenerating its quality.

## Hydrological Cycle

The principal supply mechanism of fresh water is the global hydrological cycle. Moisture from both the world's landmasses and seas evaporates, leaving any salts behind. Clouds then form and the moisture precipitates as rain or snow.

This water from the sky replenishes surficial reservoirs such as rivers and lakes, remoisturizes the soil, and recharges aquifers (underground layers of permeable soil or rock). Most of the precipitation returns to the sea directly through coastal groundwater flow or indirectly through seabound streams. Thus, the hydrological cycle is completed.

Human settlements and commerce have often appeared where fresh water was most accessible and plentiful. One of the cradles of civilization, for example, arose in the fertile plains between the Tigris and Euphrates rivers, in present-day Iraq. Its classical name, Mesopotamia, is derived from the Greek phrase for "between rivers." Likewise, Egyptian civilization developed along the fertile valley of the Nile River.

People also often settle in areas of fresh water deficit, in some cases to avoid disease. In parts of West Africa, for



*Fountain of the pharaohs and source of agricultural fertility, the Nile is the world's longest river.*



example, rural people have moved away from fertile areas to avoid river blindness, a parasitic disease transmitted by blackflies that breed in fast-flowing water. In Chile and Peru, it is the excellent maritime fishery that attracts people to the desert coast.

### Water Wealth

The amount of water theoretically available for human use is far greater than what is available in practice. The gross and per-capita water “wealth” of various countries is shown in Table 1. Of course, population density, location, and year-to-year fluctuations in rainfall have a major bearing on a nation’s “real” water wealth.

In areas where annual rainfall is low and highly variable (e.g., sub-Saharan Africa, Saudi Arabia, southern Iran, Pakistan, western India, southwestern United States, and northwestern Mexico), water shortages are common. In several areas of the African Sahel, which has suffered chronic debilitating drought, average annual rainfall has significantly declined in the past 20 years.

The annual global harvest of fresh water is estimated at between 2.6 and 3.5 trillion ( $10^{12}$ )  $m^3$ . The lesser value would be enough water to fill over one billion Olympic-size swimming pools! According to statistics compiled by the World Resources Institute and the International Institute for Environment and Development in Washington, DC, 73% of this total is devoted to crop irrigation, 21% goes to industry, and the remaining 6% is used for domestic and recreational needs such as drinking and washing.

These proportions vary from region to region depending on the economic base. Industries in Eastern

Table 1. Average annual availability of fresh water (surface and groundwater) in 20 selected countries.

Country	Total availability ( $m^3 \times 10^9$ )	Per-capita availability ( $m^3 \times 10^3$ )	Country	Total availability ( $m^3 \times 10^9$ )	Per-capita availability ( $m^3 \times 10^3$ )
Brazil	5190	36.7	Venezuela	856	46.9
USSR	4684	15.4	Malaysia	456	28.0
Canada	2901	111.7	Mexico	357	4.3
China	2800	2.6	Sudan	130	1.3
Indonesia	2530	14.7	Iran	118	2.5
USA	2478	10.2	Ethiopia	110	2.4
India	1850	2.4	Peru	40	1.9
Bangladesh	1357	12.7	Botswana	18	0.8
Burma	1082	28.0	Kenya	15	0.7
Colombia	1070	35.7	Saudi Arabia	2	0.2

Source: *World Resources 1987* — a report of the International Institute for Environment and Development and the World Resources Institute, Washington, DC, USA.

Europe, for example, account for up to 80% of the region's use of fresh water. By contrast, industry in Ghana accounts for only 3% of the country's total use of fresh water.

## WATER FOR PEOPLE

Despite its small proportion of global water usage, fresh water for domestic purposes, especially for drinking, is a major concern of Third World countries and development agencies such as IDRC. The reason is simple: access to sufficient and reliable sources of clean water is crucial to public health and welfare.

In 1980, an estimated 1.8 billion people were exposed to waterborne diseases in the developing world. Every year, tens of millions of these people become ill with diarrhea, dysentery, cholera, typhoid, and other diseases. Children are particularly susceptible — in 1987 alone, some 4.5 million children died of diarrheal diseases. Many cases of disease and mortality could be prevented through a combination of improved water supplies and health education.

Although human beings need only about 5 L of water each day for cooking and drinking, according to the World Health Organization (WHO), good health and cleanliness demand a further 24 or 25 L. In fact, it is arguable that, for many of the world's poor, the first health requirement is not cleaner water but more water. Even water of questionable potability (because of high salt content, for example) may be sufficient for bathing and washing clothes, cooking utensils, and plates, thereby promoting health.



*Daily trek in Kenya — a long way for a little water.*



A major constraint on water consumption is the distance to the source. In many Third World countries, women and children are the water bearers and must walk for several hours each day just to carry home 20–25 L of water, which is often contaminated. Generally, consumption increases as the water source gets closer. Studies of water collection in Africa, however, have shown that the equation is not altogether simple and that a plateau is reached. When the round-trip time drops below 30 min, water consumption levels off. It is only when water is installed right in the consumer's house or yard, making the collection time negligible, that another major boost in consumption occurs. All this simply underlines the tremendous investment that will be required to maximize the health benefits of improved water supply.

**Table 2. Access (% of population) to safe drinking water (SDW) and sanitation (SS) in various developing countries.**

Country	SDW	SS
Argentina	64	84
Bangladesh	41	4
Botswana	57	36
Burma	26	21
Guinea	17	13
Haiti	34	20
Indonesia	32	30
India	55	8
Iran	68	72
Kenya	28	45
Malaysia	79	72
Mexico	76	58
Peru	55	39
Rwanda	60	60
Saudi Arabia	91	82
Zambia	49	74

Source: *World Resources 1987* — a report of the International Institute for Environment and Development and the World Resources Institute, Washington, DC, USA.

### Progress of the Water Decade

The United Nations declared the 1980s the International Drinking Water Supply and Sanitation Decade (the "Water Decade"). It did so because of the proven connection between water and health and the fact that so many people in the developing world were known to lack safe drinking water and proper sanitation.

Access to safe drinking water and sanitation (toilets and latrines) can vary greatly from one developing country to another (Table 2). United Nations data for 94 developing countries indicate that, by 1983, 74% of the urban population but only 39% of rural people had access to safe drinking water. As for access to sanitation facilities, the corresponding values were 52 and 14%.

According to one progress report on the Water Decade, the provision of urban water and sanitation kept pace with rapid population growth between 1980 and 1985 and, in the rural water-supply sector, real progress was achieved. In rural sanitation, however, developing countries lost ground. Needless to say, an enormous amount of work still needs to be done to ensure universal access to clean water and sanitation. It has been and will continue to be a priority of IDRC.

### Ingredients of Adequate Supply

Ensuring an adequate supply and the proper use of potable water requires several general components:

- suitable technologies and materials for detecting, harvesting, storing, purifying, testing, and delivering water, as well as preventing contamination;
- trained personnel to apply these technologies and to install and maintain equipment;

- overall coordination of a country's water supply, including regular water monitoring and testing; and
- public cooperation, participation, and education regarding water and sanitation.

For developing countries, there are heavy financial and technical constraints to securing these components. Piped water is a good example. Although urban penetration is high in developing countries, many residents of slums and makeshift communities are not served at all. In rural areas, the cost of extending piped water is enormous. Until such service is possible, poor rural and urban communities around the world will have to rely on other sources such as wells equipped with handpumps. Tests to determine the water quality of existing wells are only sporadically, if ever, performed because of logistics and cost. Adding more wells to national inventories will place an increasing burden on government services.

There is thus a growing perception that the job of delivering clean water to all the people of the developing world cannot be done singlehandedly by ministries of health. Even when they do have funds and personnel to cover hardware and installation costs, water programs rarely succeed without local support and participation. The end users of the technology, especially women, must be involved from the outset.

Increasingly, then, Third World governments and development agencies such as IDRC are turning to nongovernmental organizations (NGOs) and the intended beneficiaries to take on much of the responsibility, especially labour. Two IDRC-supported projects (in Egypt and Kenya) exemplify this trend.

## A Personal Responsibility

Egyptian villages face serious health problems, especially diarrheal and parasitic diseases transmitted via contaminated drinking water. Pathogens thrive in an environment where drainage of wastewater from houses is inadequate and children defecate in the streets because latrines are designed with adults in mind. A 1982 study revealed that neither villagers nor local health personnel were well informed about environmental sanitation. A more recent study suggests that village women do not see the resolution of community problems as their personal responsibility.

An "action-research" project funded jointly by IDRC's Social Sciences and Health Sciences divisions is attempting to alter such attitudes and behaviour by directly involving villagers in environmental improvement. Social scientists from the Social Research Center of the



*A polluted water source in Sri Lanka. Water improvement rarely succeeds without local support.*



American University in Cairo are conducting this major study in two Egyptian villages. Their goal is to uncover shortcomings in the management of local water and sanitation programs and to include village women in the planning and maintenance of facilities.

The project calls for the training of village leaders and local health workers as communicators, each responsible for 30 households. Their job is to organize village women to discuss water problems and propose workable solutions.

### **People versus Schistosomiasis**

In Kenya, another IDRC-supported study of two communities has recently demonstrated the power of grass-roots action. In this project, the health problem targeted by researchers from the Kenya Medical Research Institute was schistosomiasis, a waterborne parasitic disease common in irrigated areas of the tropics.

In one community (the study group), the infection rate was 91% among children and youths from 5 to 19 years of age. Health education was introduced and the villagers themselves constructed wells, bathhouses, and latrines, partly with their own money. In the second community, the infection rate was 64% in the same age group. This cluster of villages served as the control group; that is, there was no intervention program.

Both groups were eventually treated with drugs to bring the schistosomiasis infection rate to almost zero. A year later, the results were striking. The infection rate among children and youths in the study community was 41%; in the control group, the infection rate was 77%.



*New bathhouse under construction at the Mwea irrigation scheme in Kenya. Villagers are determined to break the cycle of infection of the waterborne disease, schistosomiasis.*

# WATER FROM THE EARTH

IDRC set up its Earth Sciences Program 5 years ago as the flagship of its fledgling Cooperative Programs Division. As the divisional name suggested, the cooperative programs were created as a way of promoting research links between Canadian research scientists and their counterparts in the Third World. Since that time, other research programs have been added to the Division's portfolio. To reflect its strength in the various earth sciences such as hydrogeology, the Division changed its name to the Earth and Engineering Sciences Division.

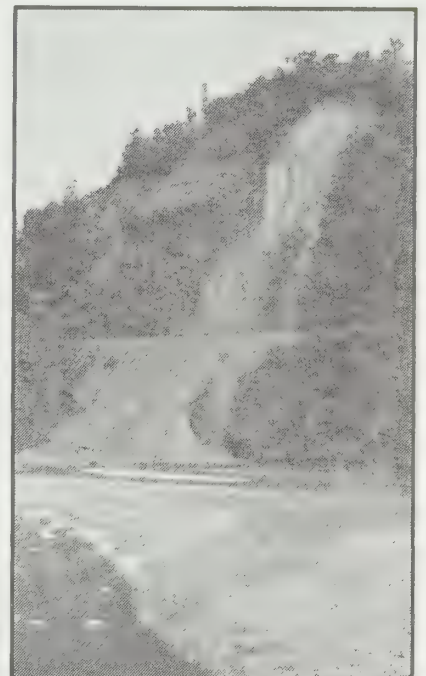
From the very beginning of the Earth Sciences Program, water was identified as one of the most precious geological resources; therefore, it became a research priority. By mid-1988, some 25 research projects under the category of "water in the environment" were in progress. These projects include investigations of urban and rural groundwater resources, drinking water contamination, river pollution, soil erosion by runoff, riverbank erosion, glacial and snowmelt, the extraction of drinking water from coastal fog, and water basin management. This section describes a number of projects aimed at understanding the dynamics of water sources, particularly groundwater for drinking, as well as problems of contamination.

## Predicting the Mighty Indus

About 125 million people live in the Indus Basin, most of them in the dry, subtropical plains of Pakistan. The Indus River and its tributaries irrigate their fields, produce their electricity, and supply their cities with water. The glaciers and snow of the Himalayas are the sources of this great river system, and the rate at which they melt affects Pakistan's agriculture, industry, and, indeed, the quality of life.

As late as 1960, most of the waters of the Indus flowed unobstructed into the Indian Ocean. Since then, the river has been harnessed in large measure: a dam and irrigation systems have been completed under the direction of Pakistan's Water and Power Development Authority (WAPDA).

With such a large investment at stake, the nature and variability of stream flow from the mountains became a concern. In 1984, WAPDA engineers launched a major 3-year cooperative research project with Canadian hydrologists from Wilfrid Laurier University in Waterloo,



*A landslide in Nepal — water and soil can be a dangerous mix.*



Ontario. Their sophisticated weather-monitoring work in high-altitude areas of the Himalayas has led to a more detailed understanding of the dynamics of glacial and snowmelt.

This project is now complete and WAPDA is planning and discussing with IDRC a multimillion dollar implementation phase that would be funded by the Canadian International Development Agency (CIDA). Among other things, the follow-up project would create a network of high-altitude, weather-monitoring stations to ensure accurate prediction of river flow. As a result, Pakistan will become more adept at water conservation and the operation of reservoirs and irrigation systems.

## Stab in the Dark

Very few developing countries are blessed with a snow-fed river like the Indus to quench their thirst and drive their economies. With only meager surface water resources, many countries rely heavily on subterranean water. In the absence of adequate financial resources or an understanding of local geological formations, drilling programs have often taken a “stab-in-the-dark” approach, with disappointing results. Proper hydrogeological studies, however, can help remove the guesswork from water prospecting.

Africa has a particularly difficult problem with its supply of fresh water, especially for human consumption. As one water expert put it, the continent has the “wrong geology for easily finding groundwater.” The African shield possesses relatively few sedimentary basins with good groundwater, and most aquifers are small and intermittent or “discontinuous,” making it difficult to site wells. Under the Earth Sciences Program, a number of studies are being conducted to improve the understanding of water-bearing formations and their natural recharging systems and to develop techniques for siting wells.

One of these projects focuses on the small East African country of Uganda. Only about 6% of the country’s rural dwellers have access to an acceptably safe supply of water. The poor storage capacity of aquifers limits the availability of groundwater, especially in the northern and western areas. Also, in the dry season, surface water is often drastically reduced.

In basic terms, the geological structure of the northern region consists of a substratum of crystalline “basement” rocks covered by a discontinuous mantle of weathered bedrock. Water is contained in fractures of the basement rocks or in the overlying weathered bedrock. Because of the discontinuity of these shallow aquifers and their meager storage capacity, drilling has often resulted in

wells that are dry or have low yields. Between 1930 and 1980, some 6000 water boreholes were drilled in Uganda. A 1981 survey indicated, however, that as many as 70% of these water sources had ceased to function. It is estimated that between 10 000 and 20 000 new boreholes are needed to ensure a safe, reliable water supply to Uganda's rural citizens.

In 1980, coinciding with the beginning of the UN Water Decade, the United Nations Children's Fund (UNICEF) began providing assistance to the Ugandan government to rehabilitate existing wells and drill new ones. The drilling started in 1984. To date, water yields have been low, with about one in five boreholes turning out to be dry. Despite less than spectacular results, drilling operations do provide a favourable context in which to investigate the factors that make a geological formation more or less likely to yield adequately and recharge sufficiently.

In 1985, a Ugandan-Canadian research team of hydrogeologists, funded by IDRC, teamed up with UNICEF to take advantage of the window of opportunity afforded by the drilling program. The Canadian team is led by two scientists: an experienced private consultant in the area of hydrogeology and a professor of geology from the University of Toronto. The Ugandan team is composed of an engineer and a hydrogeologist from the Water Development Department of Uganda's Ministry of Lands, Mineral and Water Resources.

Under this cooperative project, the researchers are "logging" each borehole for its geological and geophysical characteristics. They are also conducting tests to determine the permeability of the rocks they encounter. This provides information about the rock formation's water-carrying capacity. Furthermore, the age of the groundwater — and, hence, the renewability of each aquifer — is determined by sophisticated testing of water



*The West African nation Burkina Faso is prone to drought and water shortages. Here, the White Volta has been reduced to an overgrown puddle.*



samples for the presence of specific chemical isotopes. (The rates of decay of certain isotopes are well known, making them useful for dating.)

The resulting data will enable the researchers to prepare a conceptual model of the study area's overall hydrological system. This, in turn, will allow planners and engineers to predict how the system will behave under various rainfall and pumping conditions. At a more immediately practical level, the project will produce a hydrogeological map and set of criteria to guide engineers, water supply planners, and development agencies in the siting of wells.

In the drought-prone Sahel, 4000 km west of Uganda, lies the landlocked nation of Burkina Faso. Its climate, geography, and geology have combined to give it chronic water shortages worse than those of Uganda. The availability of surface water is minimal and boreholes are an important source of water for small towns and villages. The success rate for drilling boreholes of low output (less than 5 m<sup>3</sup> of water per hour) is about 70%; for larger wells, however, this value plummets to 15%. Under such nebulous conditions, drilling is a gamble.

To help turn water prospecting into a more precise exercise, scientists from the Université du Québec à Chicoutimi are collaborating, with IDRC funding, with African counterparts from the Institut des sciences de la nature, part of the Université de Ouagadougou. Like the Ugandans, they are attempting to establish what geological conditions lead to a high yield of water.

A third project, in neighbouring Niger, with similar objectives and approach, is being conducted as a collaborative venture between the Département de géologie of the Université de Niamey in Niger and the Laboratoire de géochimie isotopique et de géochronologie of the Université du Québec à Montréal. A separate grant from IDRC's Fellowships and Awards Division is also allowing a young Canadian researcher on the team to complete his PhD thesis in geology.

In all three of these groundwater projects, the African researchers have had the benefit of working with Canadian experts in hydrogeology and related research methods.

## **Living Close to Your Water Supply**

Whether you reside in a long-established city of the North or a mushrooming metropolis of the Third World, environmental degradation seems to go hand in hand with industrialization and urban living. In Latin America, many important rivers run through cities and industrial areas. Not surprisingly, these rivers easily become polluted with



*Learning proper hygiene in Thailand.*

untreated domestic and industrial wastes, as well as farm chemicals.

People living along these rivers sometimes have no choice but to drink untreated water. In urban areas, contaminants sometimes enter the drinking water system as a result of negative pressure in pipes during water cuts. Urban water is usually treated for organic wastes but not for chemicals. How does this situation affect public health and which segments of the population are most at risk?

An international team of epidemiologists, toxicologists, chemists, and physicians is currently trying to answer this question. With backing from IDRC's Health Sciences Division, they are studying human exposure to heavy metals and pesticides. The people being studied in Bolivia, Chile, Colombia, Ecuador, Peru, and Venezuela all live along polluted rivers.

The researchers have taken blood, urine, and hair samples for analysis and have physically examined the subjects. The resulting data are being correlated with other factors such as proximity to the pollution source and level of income. In essence, the researchers are providing a scientific snapshot of the public health side of the contamination problem. They hope their results will motivate national authorities to monitor river pollution better and to pass related legislation.

The developing world has numerous "megacities" whose water supplies are threatened not only with contamination but also with overexploitation. Bangkok, Cairo, Dakar, Mexico City, and São Paulo are some of the better known examples.



Urban populations often grow faster than the rate at which basic services such as water and electricity can be installed. As the ring of suburban neighbourhoods, including slums and squatter settlements, expands around the city core, there is a scramble to find new sources of water. More often than not, the solution is to drill new wells to tap aquifers, usually in an uncoordinated fashion. Without a proper understanding of the underlying geology of the area, this haphazard development of groundwater supplies leads to a number of serious problems: contamination from domestic and industrial sources, sinking land (or soil subsidence), and, in the case of coastal cities, saltwater intrusion.

Surface water (from streams, rivers, lakes, and reservoirs) is more easily polluted than groundwater but can be cleaned up relatively quickly. Groundwater, however, may be adversely affected for decades once contaminants have found their way into the hydrogeological system. In the case of saltwater intrusion, correcting the problem is very costly and, sometimes, the situation is irreversible. Likewise, land subsidence caused by overpumping of groundwater from an aquifer is probably irreversible.

IDRC's Earth Sciences Program supports a large network of urban hydrogeology projects around the world aimed at helping large cities to better manage their groundwater resources. The main focus of the network is the burgeoning cities of Latin America; however, clusters of projects are also under way or being developed in Africa and Asia. In Latin America, an estimated 100 million people live in large cities; only half of them have access to clean water. IDRC is currently supporting urban groundwater research in Mexico City, in São Paulo, Brazil, and in Montevideo, Uruguay. Proposals from several other countries are also under consideration.

## The Sinking City

Mexico City offers perhaps the most dramatic example of the water supply issues and solutions facing city residents and water supply specialists. With a population of 18 million, Mexico's capital is already the world's largest city and is expected to grow to more than 25 million by the year 2000. This places, and will continue to place, enormous demands on the groundwater resources of the Valley of Mexico in which the city is located.

Overpumping of the Valley's aquifers has led to serious soil subsidence since the 1940s. As surface aquifers are depleted, water in the overlying clays is also sucked out. The lowered groundwater pressure results in the compression of the clays, a slow process called

“consolidation.” This, in turn, causes the gradual sinking of land at the surface.

On such an unstable base, city buildings begin to settle, often unevenly, public water mains and sewers crack, and natural drainage patterns are altered. Add to this the otherwise unrelated geological fact that Mexico City lies in an earthquake zone. The result is a recipe for disaster, as demonstrated by the catastrophic earthquake of 1985 in which thousands of people died or were injured and thousands of buildings were destroyed. It is sadly ironic that several libraries and archives containing important information on the hydrogeology of the Valley of Mexico were destroyed in this earthquake.

In 1985, before the earthquake, a research team from the Instituto de Geofísica of the Universidad Nacional Autónoma de México and the Groundwater Research Institute of the University of Waterloo in Canada had been studying the city’s groundwater resources. From available records, it was assumed that only 30% of the city’s water came from aquifers, with the rest drawn from surface sources. It was also thought that beneath the city there were two relatively thin aquifers, with clay in between, and that the recharge rates were insufficient to allow continued expansion of the water supply. The prospect of the world’s largest city running out of water was indeed alarming and spurred the Mexican and Canadian scientists to joint action.

Following the 1985 earthquake, the government decided to find out more about the geology of the Valley and, therefore, arranged to have the State petroleum corporation, PEMEX, drill a number of wells, some as deep as 3000 m. The IDRC-supported research team had already begun its work and was thus in an excellent position to use these wells to learn more about the city’s aquifers.

Recent findings of the project are dramatic. Happily, they paint an optimistic picture of Mexico City’s future prospects with regard to water supply. The disturbing news uncovered by the researchers is that Mexico City has been far more reliant on groundwater resources than previously admitted. This probably accounts for the severity of the subsidence problem. The researchers found that 93% of the city’s water supply, not 30%, is coming from aquifers.

The good news is that the underground water-bearing structures appear much larger than previously thought. Observations indicate that, rather than two thin aquifers near the surface, there is really one very large aquifer under the city. At places it extends down some 2000 m, with the lower part being composed of a thick layer of sediment and volcanic rocks. There is also evidence of water circulation at even lower levels.



These findings imply that by drilling deeper wells, Mexico City could tap a large and hitherto unexploited source of groundwater. This would help ensure the water needs of the growing population for decades to come and stop the overexploitation of the shallower section of the aquifer. Also, because of the depth of the source, the water would be better protected from industrial pollution.

There is one more piece of good news. The researchers also found that the compressible clays mentioned earlier occur only near the surface. Thus, exploitation of deeper wells would prevent further land subsidence.

These preliminary findings are most encouraging. Further research will be needed, however, to provide a new mathematical model of the Valley of Mexico's hydrological system. This will help to put the management of Mexico City's water supply on a sounder footing.



*A girl fetches water for her family in a shanty town of Santiago, Chile.*

## The Dynamics of Contamination

In São Paulo, Brazil, other researchers from the University of Waterloo's Groundwater Research Institute are working with the Instituto de Geociências of the Universidade de São Paulo to observe groundwater pollution caused by waste-disposal sites. The electrical properties of contaminated water differ from those of uncontaminated water. Using this phenomenon to their advantage, the Waterloo scientists earlier pioneered the development of relatively inexpensive geophysical techniques for detecting and tracking water pollutants.

Working with the Brazilians, the University of Waterloo research team is applying the new methods to the São Paulo environment. New knowledge of the effects of contaminants on groundwater quality should make for better waste management in one of the developing world's most industrialized and polluted cities. The ultimate beneficiaries of this research will be the 7 million residents of São Paulo (half the population) who depend on local wells for their drinking water.

Some 1500 km to the southwest of São Paulo, the industrial, coastal city of Montevideo, Uruguay, is also becoming increasingly reliant on aquifer water; farm soil erosion has severely cut the amount of water available from reservoirs in the Santa Lucia River basin. However, overuse of the groundwater has caused the water table to drop and salt water is beginning to contaminate groundwater. IDRC-financed researchers have been studying Montevideo's aquifers and sources of contamination, with a view to controlling the water table and water quality.

In West Africa, researchers in Senegal and Benin have also been investigating the intrusion of salt water, as well as other problems of urban aquifers. In Tanzania,

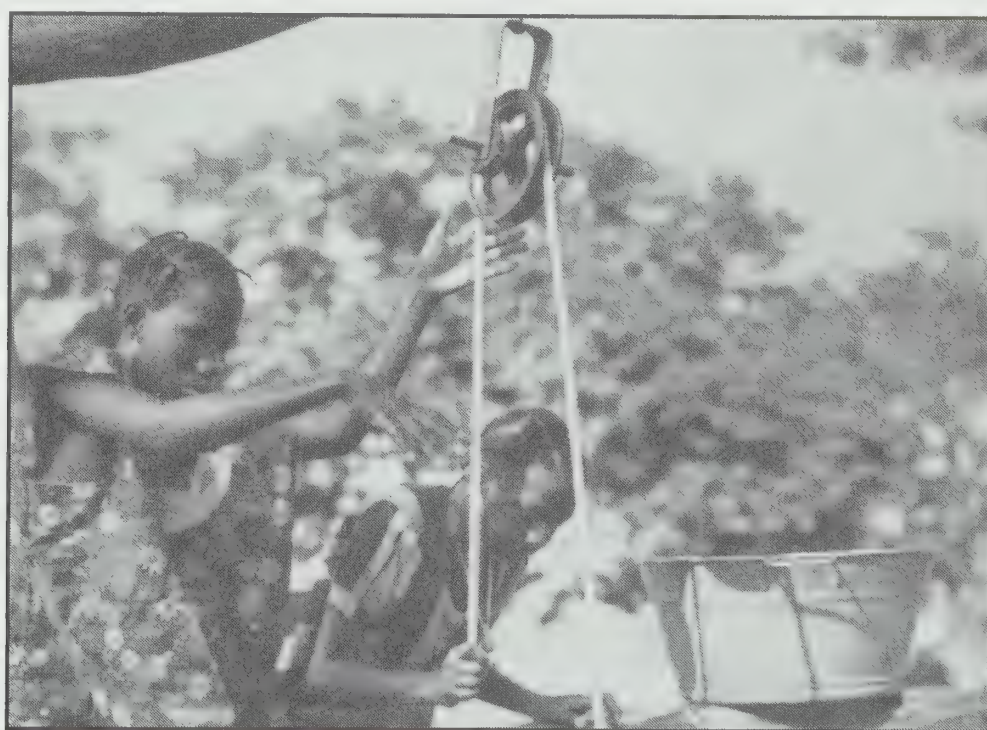
IDRC's Health Sciences and Earth and Engineering Sciences divisions are supporting the Ardhi Institute in its investigation of water pollution in the capital city of Dar es Salaam. Researchers there recently began a 2-year study of the link between pit latrines and the contamination of groundwater and piped water.

## DELIVERY AND STORAGE

Structures for conveying and storing water are among the most enduring and impressive engineering feats of pre-Christian civilization. The Roman aqueducts and baths, the irrigation "tanks" of ancient Sri Lanka, the deep wells of the Valley of the Nile, and the cisterns of Carthage are but a few examples. However, despite the marvels of both ancient and 20th-century civil engineering, much of humanity continues to rely on very simple water technologies. Wells, either hand dug or mechanically drilled or excavated, are a major source of water for household use. A simple bucket attached to a rope or pole often serves as the vessel of collection. The tedious, backbreaking job of drawing and transporting water usually falls to women and children and may take several hours of walking per day.

### The Handpump Option

The Third World has millions of village wells. For convenience of access, many are left uncovered, exposing them to contamination from people, farm animals, and



*Senagalese women drawing water. An uncovered well is a threat to water potability.*



# WHAT IS IDRC?

The International Development Research Centre (IDRC) is a corporation created by the Parliament of Canada in 1970 to stimulate and support scientific and technical research by developing countries for their own benefit. Although IDRC is funded entirely by the Canadian Parliament, to which it reports annually, its operations are guided by an international 21-member Board of Governors. Under the IDRC Act, the chairman, the vice-chairman, and 9 other governors must be Canadian citizens; in practice, 7 of the remaining 10 governors are from developing countries.

The Centre's programs help developing countries to build the scientific competence of their institutions and their researchers so that these countries can work to solve their own problems. Opportunities are given to researchers to broaden their experience through practical work assignments or advanced studies.

IDRC emphasizes the role of the scientist in international development and encourages Third World countries to draw on the talent of their own scientific communities. Building a strong local base for future research is an important objective of most IDRC-supported work. Research projects are identified, designed, conducted, and managed by developing-country researchers in their own countries, to meet their own priorities.

IDRC helps to create and supports international research networks through which developing countries can learn from each other, share common experiences, and conduct similarly designed studies in areas of mutual concern. It also promotes cooperation between developing-country researchers and their counterparts in Canada through so-called cooperative projects.

## Cooperative Projects

Most of IDRC's funds support research conceived, managed, and carried out by Third World scientists. The Centre also supports collaboration between scientists in developing countries and their counterparts in Canada — whether academic,

governmental, or private. Cooperative projects can be in any of the research areas supported by IDRC, provided there is recognized Canadian expertise in that area.

## Research Programs

**Agriculture, Food and Nutrition Sciences** — In this group of related sciences, emphasis is on farming systems, social forestry in arid and semi-arid lands, and aquaculture. Specific areas of support by the Agriculture, Food and Nutrition Sciences Division include previously neglected food sources such as root crops, food legumes, and oilseeds; agroforestry (growing trees and crops together); multiple cropping systems; improvement of pasturelands; use of nonconventional feeds for animals; fish and shellfish farming; postproduction systems for the preservation, processing, and distribution of food crops, fruit, and fish; and the economics of small-scale farm production and marketing.

**Health Sciences** — The support of the Health Sciences Division is concentrated in three broad areas of applied research: health and the community, health systems, and health and the environment.

**Social Sciences** — Research supported by the Social Sciences Division is designed to improve understanding of the social and economic issues related to international development, permitting researchers and policymakers to formulate policy options in several thematic areas. These include education, population and women's issues, urban policy, rural development, resource management, environment, energy, economics, science and technology policy, and public policy.

**Earth and Engineering Sciences** — The Earth and Engineering Sciences Division supports research in three main areas. One program aims at helping small- and medium-scale enterprises in developing countries create jobs. The Earth Sciences Program focuses on hydrology, hydrogeology, geotechnics, and small-scale mining technologies. Shelter is the theme of

a third program supporting research using local resources to develop improved, low-cost construction materials and techniques.

**Information Sciences** — Support given by the Information Sciences Division helps developing countries to establish regional and national information systems and improve library infrastructures at these levels; participate in international information networks; create specialized information centres (serving a region or the world) on development-related subjects; strengthen sectoral information programs, especially in agriculture, health, population, industry, the environment, cartography, and social issues; and develop information tools and methods. The Division's computer systems group provides internal services and distributes MINISIS, a bibliographic software package designed by IDRC, to developing countries. In addition, a library and micrographics unit serve IDRC staff, the Canadian development community, and IDRC-supported projects.

**Communications** — The aim of the Communications Division is to strengthen the ability of research institutions in developing countries to prepare and disseminate scientific and technical information, particularly on projects supported by IDRC. Services provided by the Division include the publication and dissemination of the results of IDRC-supported research via print and film media, public affairs, and translation.

**Fellowships and Awards** — The Fellowships and Awards Division funds the training of junior and senior Third World scientists, managers, and planners working in sectors covered by IDRC's program divisions. Preference is given to individuals from the least-developed countries and the emphasis is on professional upgrading rather than basic training. In addition, the Division supports practical, nondegree group training to improve technical, research, and administrative skills of individuals. A portion of the Division's funds is also used to encourage the involvement of young Canadian

researchers in scientific areas of concern to IDRC and to expose them to the problems of the developing world. These doctoral students are posted to a Third World country for studies, research, or placement.

## **Funding and Selection of Projects**

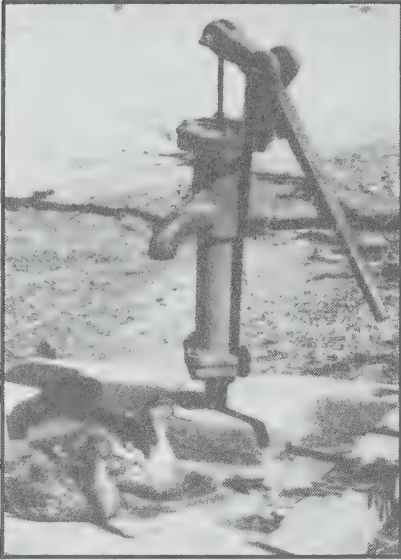
Each program division channels funds to institutions in developing countries (government departments, universities, research centres, etc.), to international and regional institutions, and to Canadian institutions. The recipient is expected to pay a portion of the costs.

All projects are reviewed by IDRC's professional staff and assessed in light of factors such as

- **Development priority:** Is the proposal consistent with national or regional development goals?
- **Regional applicability:** Are the research findings likely to be applicable in developing countries or regions other than the one in which the research takes place?
- **Usefulness:** Will the research help close gaps in living standards or lessen the imbalance in development between rural and urban areas?
- **Local resources:** Will the project make full use of local resources and research workers from the region?
- **Training:** Will the project result in better trained and more experienced researchers and more effective research institutions?
- **Research area:** Does the research fall within IDRC's areas of concentration?

When IDRC agrees to support a project, it enters into an agreement with the developing-country institution. The agreement stipulates the project's purpose, research methods, payments, and schedule for research and progress reports.





*Duck soup? Just add water . . . but don't let the critters contaminate the well.*

debris. In recent decades, however, imported electric or diesel-driven pumps and handpumps have improved the rural water scene, making water collection more efficient and reducing the risk of contamination.

Unfortunately, these cast-iron imports haven't stood up well to daily village use. A handpump designed for light use in Japan or Canada, for example, will not long survive the punishment from 50 Ethiopian families drawing water all day long. As a result, rusty, broken-down pumps, abandoned for lack of money to buy spare parts, are a common sight in the rural localities of developing countries.

Mechanically speaking, handpumps are simple. One might think, then, that designing the "ideal" Third World handpump (one that can be manufactured in the country or region and operated and maintained by villagers) would be fairly easy. This is not so. The simplicity of a successful technology often masks the complexity of thought and research that went into its design. An appropriate handpump must accommodate many factors: the users' ability to pay, local availability of manufacturing materials, repair skills, local beliefs and practices, aesthetic preferences, the number of users, and even the local weather. In this sense, there is no one handpump ideally suited to all countries.

For 12 years now, IDRC's Health Sciences Division has been backing the development of various models of a "simple" handpump that take the needs of users squarely into account. The pump's below-ground components are made largely of polyvinyl chloride (PVC) plastic, which is strong, light, and widely available in the developing world. In addition, PVC plastic doesn't rust or make the water taste bad. Based on an early prototype from the University of Waterloo in Ontario, Canada, several PVC handpump designs have been, or are being, tested in 13 countries in Asia, Africa, and Latin America. Two are now being mass produced in Malaysia and Sri Lanka, and thousands of the pumps have been installed.

In terms of engineering and design, the Malaysian UNIMADE series of handpumps is the most mature in the IDRC-sponsored global network. The latest model, the UNIMADE D series, is the fourth generation of pumps to emerge from the University of Malaya in Kuala Lumpur.

Two recently approved handpump projects are particularly noteworthy. Firstly, in China, the Academy of Agricultural Mechanization Sciences has been given an IDRC grant to investigate the feasibility of large-scale manufacture of the UNIMADE pumps. Secondly, in Sri Lanka, an NGO called Sarvodaya is expanding its IDRC-supported handpump program into other dry areas of the country. Sarvodaya designed the highly successful SL5

handpump and has trained teams of young women to manufacture, install, and repair it. Under the new phase of work (supported by IDRC and CIDA), Sarvodaya is training a new group of female pump technicians. In addition, two Sarvodaya technicians visited the pump project in China to learn low-cost drilling techniques.

## International Crossroads

In May 1988, a milestone was reached on the long road toward the emergence in the developing world of mature, truly indigenous, handpump technologies. A new research and training centre, geared toward dissemination of handpump manufacturing technology, opened at the University of Malaya. IDRC is funding its first 3 years of operation.

This regional centre of excellence services the technical needs of water-supply specialists and handpump manufacturers from the government, the private sector, and NGOs. As these people are dispersed around the developing world, IDRC's Information Sciences Division has agreed to support the testing and evaluation of a "telematics" network to ensure good communications. This computer-based system would enable the training centre and its clients to exchange technical information, including graphics. Complementing this information network is a newsletter called *Waternet News*. The Malaysian engineer who perfected the PVC UNIMADE handpump and heads the new centre has a vision of a self-sustaining international network of handpump projects in place when IDRC funding ends in a few years.

Another promising pumping technology supported by IDRC is a robust device called the hydraulic ram, or "hydram." With only two moving parts, it is a simple technology dating back 200 years. A hydram pump runs on renewable energy: the kinetic energy produced by the flow of a stream to a lower level. As the water moves through the hydram, a small portion of the flow is diverted through a pipe to a higher level.

Some hydrams installed in East Africa have been operating for more than 50 years. However, modern commercial models are costly and there has been a growing trend to design smaller, lighter, less expensive hydrams that can be manufactured in developing countries.

With IDRC support, research teams in Uganda and Tanzania are collaborating in this area. They have taken inventories of hydram pumps in their respective countries and, armed with hydrological and topographical maps, have identified continuously flowing streams suitable for new installations. A computer model of hydram performance is



*From manufacture to maintenance, the Sarvodaya pump has been a success story in Sri Lanka.*



being developed to help design new hydrams that can be manufactured locally at a low cost. Village leaders will be invited to see the new designs in action at a demonstration and test site near Entebbe, Uganda.

IDRC is also supporting the development of a simple, but highly experimental, solar, liquid-piston pump at the University of Science and Technology in Kumasi, Ghana (see boxed section). If successful, this technology could help Ghana to harness its plentiful solar energy, thereby lessening the country's dependence on electricity and fossil fuels.

The liquid-piston pump has an important advantage over the conventional solid-piston pump: there is no need for the pump cylinder to be precision machined. This means that small local machine shops should be able to fabricate the device quite easily. A major challenge for the researchers is to design solar collectors efficient enough to run the pump.

Rural schools and hospitals require a good supply of safe water and stand to benefit from the introduction of

### **Solar-Powered, Liquid-Piston Pump**

A prototype "liquid-piston pump," powered by the sun's energy, is being designed by researchers in Ghana, West Africa. It works on the principle that a fluid (in this case, freon) can produce useful mechanical energy when it is repeatedly vapourized and condensed.

The pump consists of a cylinder separated into an upper and lower chamber by a flexible plastic membrane. The top chamber is filled with freon, a liquid that vapourizes at a lower temperature than water. Immersed in the freon are an evaporator coil that circulates hot water and a condenser coil for cooler water. A solar collector powers the system by heating the water in the evaporator coil. The lower chamber houses the water being pumped. It has one flap valve to let water flow in from the supply and another to let the water flow out to the elevated storage container.

Here's how one cycle of the pump works:

1. The solar collector heats the water in the condenser coil, causing it to circulate naturally.
2. The liquid freon warms up and begins to evaporate and expand.
3. As the chamber pressure increases, the flexible plastic membrane moves downward, forcing water in the lower chamber to flow through the outlet flap valve (the intake valve remains closed).
4. When the level of liquid freon drops below the bottom of the evaporator coil, evaporation ceases.
5. Meanwhile, cool water flowing through the condenser coil causes the freon to begin condensing back into liquid.
6. As the chamber pressure decreases, the membrane moves upwards, drawing water from the main supply through the inlet valve (outlet valve remains closed).

The cycle repeats itself over and over, giving rise to an undulating movement of the membrane and a flow of water to the storage tank (see diagram opposite).

the solar, liquid-piston pump. It could be used to pump groundwater or collected rainwater into raised storage tanks. This would prevent contamination of the water and allow gravity feed to buildings.

### Wind, Sun, and Water

The Health Sciences Division of IDRC is funding a project on wind-powered pumps in Panama. The research team is examining the technical performance and social acceptability of a low-cost, locally designed model. Before promoting the technology, the researchers want to be certain that it is indeed appropriate for local communities.

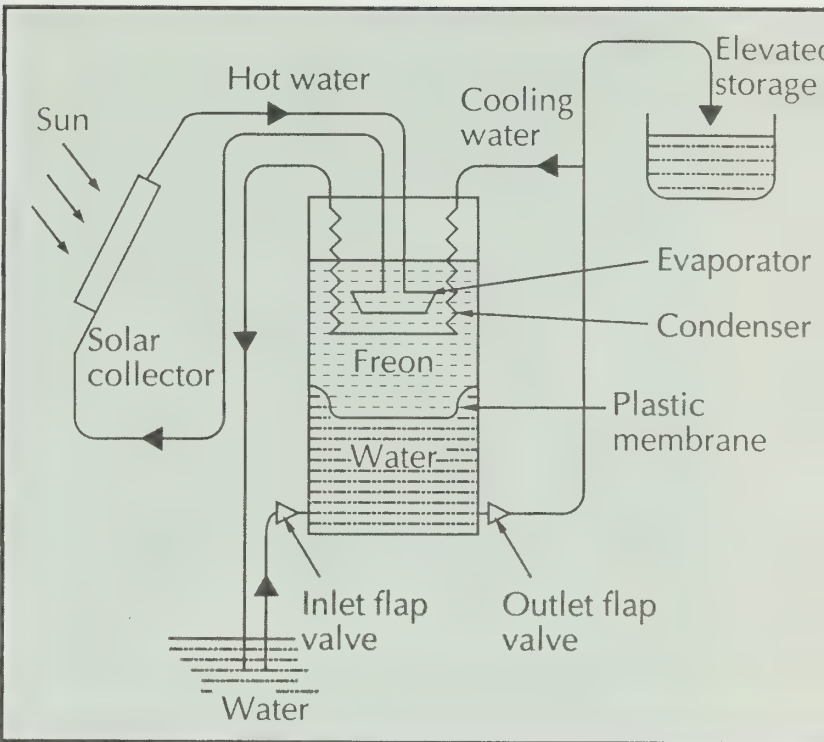
Senegal is a hot, sunny country with low rainfall. Often, rural people don't have enough water for either agriculture or household use. At present, about 20 deep wells in the country are equipped with solar-powered electric pumps, a technology intended to mechanize the rural water supply without having to resort to expensive diesel power. Unfortunately, only a few of these pumps are still working. This is because rural users weren't adequately consulted and there wasn't a proper repair and maintenance plan drawn up in advance.

To improve the chances of success of such technology, Senegalese energy researchers are designing guidelines and procedures for the correct siting and installation of solar pumps. These guidelines will ensure that both social and technical factors are properly assessed before decisions are made. The project is jointly funded by IDRC's Agriculture, Food and Nutrition Sciences and Health Sciences divisions.

### Rainwater and Cement

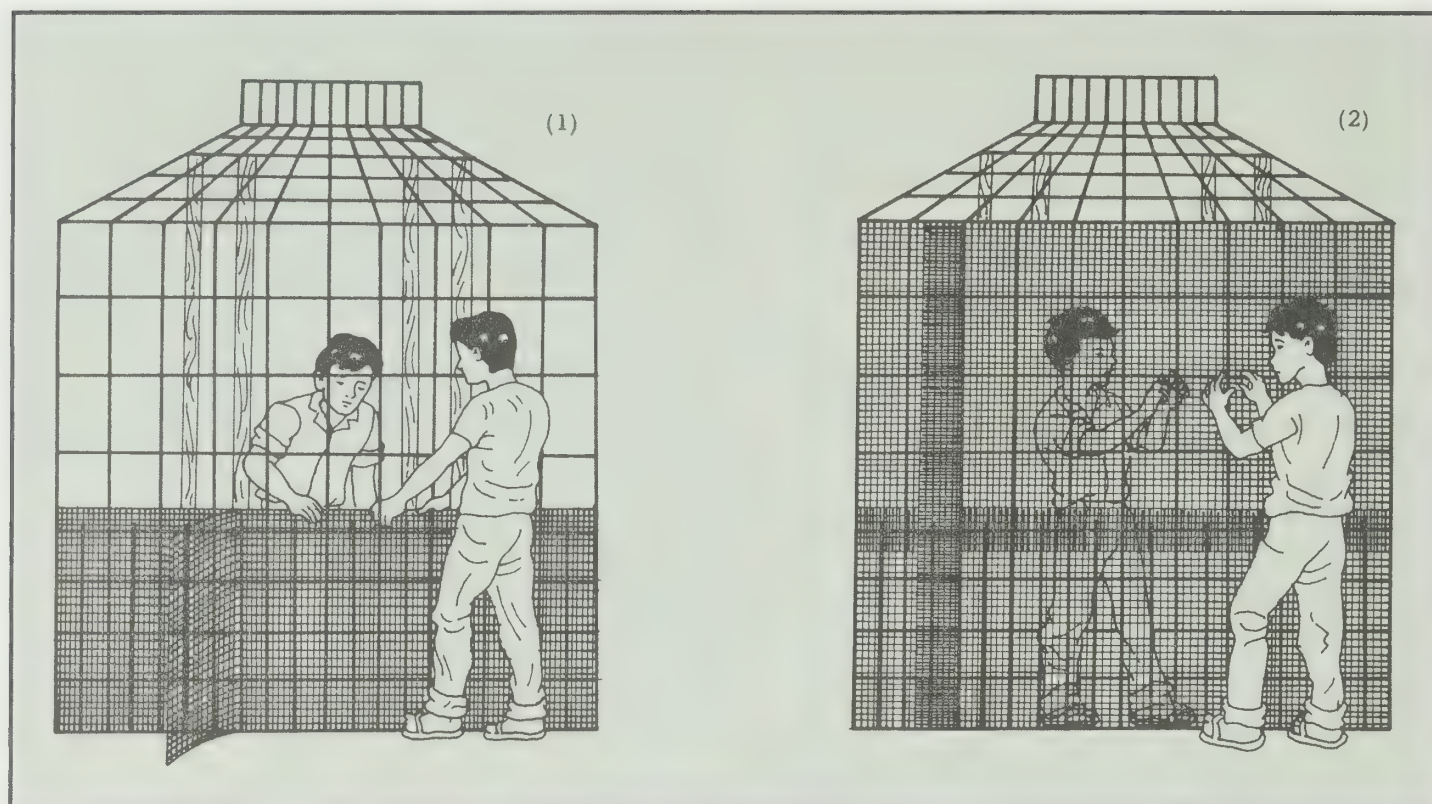
In many countries, the water table is too deep for simple handpumps to be effective. Rainwater catchment sometimes offers an attractive alternative. Compared with surface water or water from shallow wells, rainwater is relatively free of chemical and microbiological contaminants, making it safe to drink. The roof and gutter from which the rainwater is collected and the container in which it is stored, however, must be kept clean.

Over the years, IDRC has funded a number of research projects on rainwater catchment in Africa and Asia. A recently completed project on the island of Capiz in the Philippines demonstrated that ferrocement — wire mesh covered with thin layers of mortar — is an excellent,



*An experimental pump for raising water to a storage tank.*





*Illustration from an IDRC-sponsored Philippine manual on the construction of ferrocement rainwater tanks.*

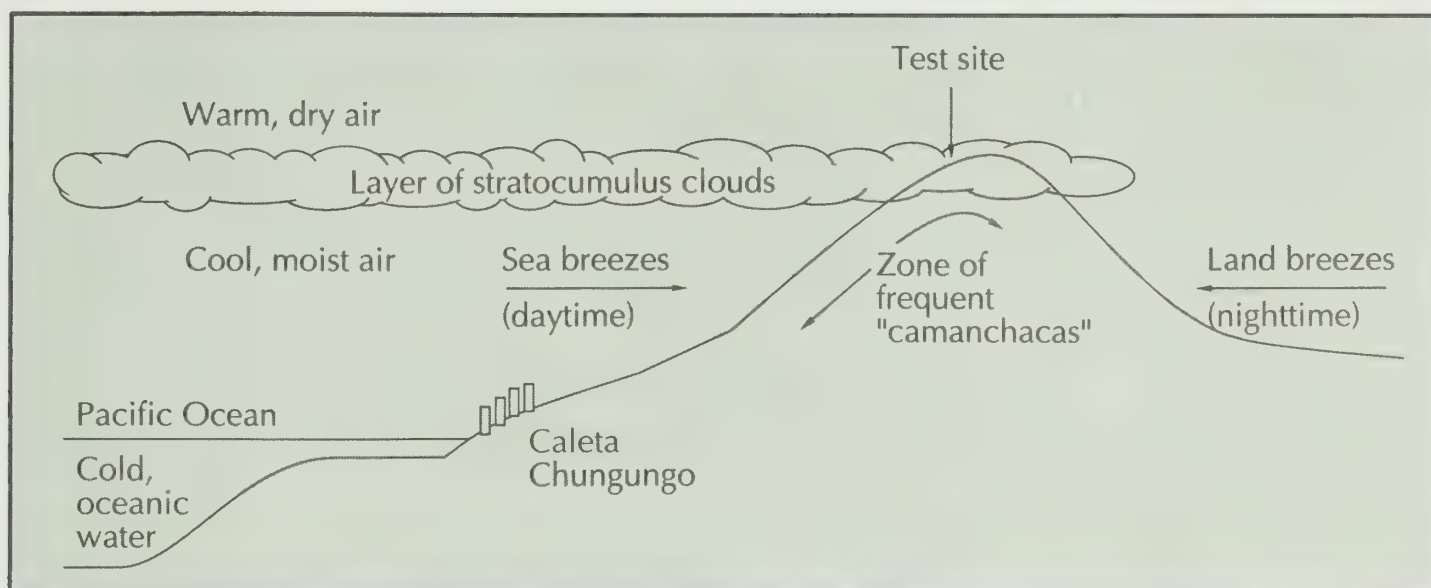
inexpensive technology for building rainwater cisterns. The Capiz Development Foundation, Inc., a community-based NGO, pioneered the use of ferrocement rainwater tanks in the Philippines. The Foundation is now preparing to disseminate this technology to other islands in the archipelago and to other Asian countries. Negotiations are under way with CIDA for the creation of a major ferrocement training centre in Capiz for this purpose.

IDRC's Communications and Health Sciences divisions jointly followed up on the success of the Capiz project. They supported the design and production of an illustrated manual on the construction and maintenance of ferrocement rainwater tanks. The work was carried out by Kabalikat Ng Pamilyang Pilipino, a local NGO in the Philippines with communications expertise. Along with posters and brochures promoting the technology, the manual was published in the Tagalog and Ilonggo languages.

Despite rainwater's good reputation as potable water, there is a risk of contamination during collection and storage. The materials used to construct the rain gutters, collection roof, and storage containers, for example, may adversely affect water quality. The University of Khon Kaen in Thailand has received an IDRC grant to look into this and other factors that lead to bacteriological and chemical contamination of collected rainwater.

## Harvesting Coastal Fog

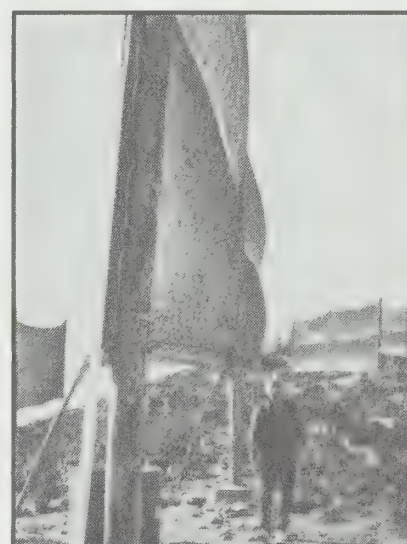
Like rain, fog is atmospheric moisture with good potential as a source of potable water. Ironically, the mountainous desert coast of Chile and Peru, where it almost



*Fog harvesting on the Chilean coast.*

never rains, is marked by heavy daily fogs that blow in off the Pacific Ocean. Here, a team of Chilean and Canadian researchers has made significant progress in tapping this novel water resource. Many tiny fishing villages in this region lack an adequate supply of drinking water. In the Chilean village of Caleta Chungungo, for example, villagers pay dearly to have springwater, often contaminated, trucked in once a week from 50 km away.

The research team, supported by IDRC's Earth and Engineering Sciences Division, is encouraged by their studies of the potential water harvest from the "camanchacas," as the fogs are called. On the mountain slopes just outside of Caleta Chungungo, the scientists have installed giant nylon nets, 12 m long by 4 m high, to extract water. Results to date show that the village water supply could be increased eightfold and cost as little as one-fifth that of trucked-in water. Even though the researchers are still busy with experiments, villagers are already tapping the new source in an informal way. Their supply of water has considerably improved as a result.



*Exploiting geography: nylon nets extract water from the "camanchacas."*  
— Courtesy R.S. Schemenauer.

## TESTING AND TREATMENT

In pursuit of the goals of the United Nations Water Decade, rural communities around the world are working with governments, NGOs, and other development agencies to install new wells, pumps, and springwater- and rainwater-collection systems, and to upgrade old systems. All this effort will be wasted, however, unless these water sources are protected from contamination.



Few Third World countries have enough lab space, equipment, chemical supplies, or trained personnel to carry out the sophisticated water-quality tests routinely done in the industrialized world. Because of this, it often takes a serious outbreak of waterborne disease to push officials into action — an approach not unlike closing the barn door after the horse has bolted. Even if the technical resources were available, expeditious transport of water samples to labs would still be a constraint. Furthermore, the sheer number of individual wells and other water points to be tested would undoubtedly overtax facilities.

### Stringent Standards

For a variety of reasons, developing countries have difficulty meeting international standards for the microbiological and chemical quality of water. If they were adhered to, many water sources that rural people depend on would have to be closed down. For example, in a

### Some Major Waterborne Diseases

*Cholera* is a highly infectious and sometimes fatal waterborne disease. Marked by diarrhea and other gastrointestinal symptoms and caused by *Vibrio cholerae* bacteria, its incubation period varies but is normally 3 days. Cholera is widely endemic in South and Southeast Asia.

*Typhoid fever* is also highly infectious and sometimes fatal. This waterborne disease is marked by fever, diarrhea, headache, intestinal inflammation, and pinkish spots on the abdomen and is caused by *Salmonella typhi* bacteria. The long incubation period of several weeks sometimes makes it difficult to pinpoint the source and time of infection. An infected person may remain a carrier even after recovery.

*Bacillary dysentery*, also called shigellosis, is caused by members of the *Shigella* family of bacteria. Marked by acute or chronic inflammation of the colon and with an incubation period of 4 days or less, this disease is a major cause of death among young or feeble people where sanitation is inadequate.

*Amebic dysentery* can cause diarrhea or constipation and is rarely fatal. Infected people lose their appetite and have abdominal discomfort, with blood and mucous in the feces. Caused by single-celled organisms, or protozoa, called *Entamoeba histolytica*, which form cysts for protection, this waterborne disease may persist as the victim continues to act as a carrier for years by excreting the microorganism in the feces.

*Poliomyelitis*, known simply as polio, is a crippling, waterborne disease caused by a virus. Symptoms of polio include fever, headache, gastrointestinal disturbance, and stiffness of the neck and back. The disease attacks the central nervous system causing paralysis of the lower limbs; it has a normal incubation period 1–2 weeks. Children from 1 to 16 years of age are more susceptible than youths and adults.

*Infectious hepatitis*, a highly infectious and sometimes fatal waterborne disease, is also caused by a virus. The symptoms of this disease are fever, nausea, loss of appetite, vomiting, fatigue, headache, restlessness, and mental confusion; infectious hepatitis sometimes results in a coma. The liver becomes enlarged and the skin and whites of the eyes become yellowish. With an incubation period of usually a little more than 3 weeks, infectious hepatitis has several modes of transmission, including consumption of contaminated water and food.

water-quality survey conducted a few years ago in the Cochabamba District of Bolivia, 60% of water samples collected from rural water sources failed to meet bacteriological standards.

The microbiological quality of water is normally determined by testing for a group of organisms known as coliforms. In particular, the presence of fecal coliforms — bacteria normally found in the bowels and excrement of human beings and other animals — is like a red flag to the public health authority. They signal the possibility that the water may also contain disease-causing organisms (see box on waterborne diseases). Standard tests for detecting coliforms are based on relatively sophisticated and expensive technology, often requiring water samples to be incubated for a long period. A new faster, simpler, and less expensive test is now being developed with IDRC support and with the developing world in mind.

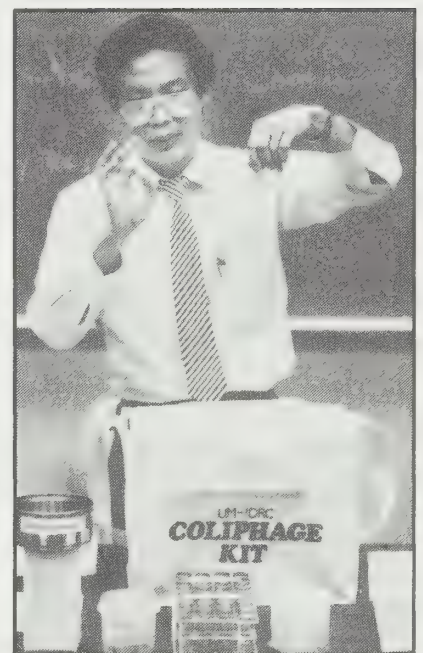
Water turbidity, or cloudiness, caused by the presence of sediment, also has a bearing on potability, although indirect. Minute suspended particles can act as shelters for bacteria and viruses, making them hard to detect and resistant to disinfectants such as chlorine.

### Appropriate Test Kit

With the help of the respected National Water Research Institute (NWRI), part of Canada's Ministry of the Environment, a new bacteriological test kit is being developed by a network of researchers in Brazil, Chile, Egypt, Malaysia, Morocco, Peru, the Republic of Singapore, and Thailand. Rather than zeroing in on the coliforms, the new test kit identifies the presence and quantity of coliphages. These organisms accompany and prey on coliforms. The beauty of this technology is that it requires neither sophisticated equipment nor a laboratory.

The researchers are also formulating a more realistic water-classification system that considers sanitary conditions at the source. The system will allow water authorities to rank water sources according to their public health risk. The ranking — perhaps on a scale of 1 to 4 — would combine the results of coliphage tests with sanitary factors observed directly at the sites (e.g., whether village wells are properly sealed or located far enough from latrines).

Water-supply specialists have cited cases in developing countries where well-intentioned health departments surveyed rural water quality by conducting traditional microbiological tests. The results were recorded manually on laboratory forms and then left to collect dust in government offices. Failure to do the necessary data analysis and follow up wasn't due to a lack of interest or



*Health ministries take note, this water-test kit is simple, fast, and cheap. — Courtesy The Citizen, Ottawa, Canada.*



resources, but to the sheer volume of the data. The new coliphage test kit promises to provide developing countries with a large and rich new pool of such information. What, then, can be done to avoid the “dusty data” syndrome? What can governments do to ensure that the new data ultimately result in better quality water for villagers?

A Malaysian research team drawn from the government’s Department of the Environment and the University of Malaya is currently working with Canada’s NWRI to solve this problem with the help of microcomputers. This work is supported jointly by IDRC’s Health Sciences and Information Sciences divisions. The aim of this highly innovative data-management project is to produce a user-friendly, low-cost software package for developing-country agencies that monitor water quality. It is based on existing software called RAISON, developed and written by NWRI for monitoring acid rain in Canada.

The adapted system will allow users to keep track of all coliphage test results and will generate maps and computer reports on various characteristics of a country’s water supply. Built into the software will be a mathematical model to quickly rank water sources according to the “risk”-classification system previously mentioned. This will make the system particularly powerful.

This project promises to give Malaysian authorities ready access to timely information on the many rural water sources in the country. They will be able to identify “hot spots” requiring decontamination or protection as well as decide where maintenance should be carried out and new water systems installed. If successful, the system will be disseminated to other interested countries.

## **Low-Cost Purification**

When it comes to the treatment of water to ensure potability, centralized, piped water systems in cities have the advantage of economy of scale. In rural areas, however, a single water source such as a well or stream may serve only a small village or just a few families. In this environment, standard disinfection methods such as boiling or chlorination may be too time consuming, too expensive, or at odds with local customs.

In recent years, IDRC has funded many research efforts to develop alternative water-treatment methods tailored to local needs. It has long been known, for example, that ultraviolet (UV) radiation can kill bacteria in drinking water. Disinfection units that use UV lamps are commercially available in industrialized countries, but are too expensive for developing countries. Researchers in Thailand and Lebanon have received IDRC grants to

investigate the use of natural UV light from the sun to disinfect water.

In India, water-related diseases are responsible for an estimated 80% of public health problems. An inexpensive water-treatment method could help turn this situation around. The Indian Institute of Technology in Kanpur has shown that the ash produced by burning rice husks (an abundant waste product on Indian rice farms) can be mixed with cement and water to produce inexpensive water filters. IDRC is currently funding a project with the Tata Research Development and Design Centre in Pune, India, to design and test such filters for household use. The results of this work will be of interest to other rice-producing countries.

The Institute has also been given funds to investigate, in cooperation with the University of Ottawa, the use of bituminous coal in household water filters. Earlier tests indicated that the coal has good potential for eliminating disease-causing bacteria and viruses from water.

Other water-treatment methods being investigated with support from IDRC's Health Sciences Division include sand filtration in Thailand and hypochlorinators for village use in Bolivia. Researchers in India are also experimenting with an extract from seeds of the Theythancottai tree as a means of removing suspended solids in water by coagulation.

Finally, the development in Botswana of small-scale solar stills for removing salt from borehole water in the Kalahari Desert should be mentioned. Isolated communities in that dry country have only a fraction of the fresh water they need for good health and comfort. Borehole water is often saline and, if regularly drunk, causes serious health problems.

A research team at the Rural Industries Innovation Centre (RIIC) in Botswana designed and built small greenhouselike structures made of glass and fiberglass.



*Assembling solar stills in the Kalahari Desert of Botswana.*



Saline water is placed in the fiberglass base of the still and is heated by the strong desert sun. The water evaporates and then condenses on the glass covers. The distilled potable water slides down the glass into a collection trough and flows into a storage vessel. Meanwhile, the salt remains behind in the base of the still. The success of this project in remote villages of Botswana has prompted requests to RIIC from other African countries to disseminate the technology.

## FRESHWATER HAZARDS

Water in motion is a mighty force that can literally move mountains. Among its most dramatic manifestations — those hazardous to human life and property — are flash floods, mud slides, and soil erosion. The natural flow of water over land and the resulting transport of soil to lower ground or even to the sea are part of the natural geological evolution of our planet. Around the world, however, soil erosion has been accelerated by human activity, with devastating consequences. Growth of human and animal populations, destructive cropping and grazing practices, and deforestation through logging are some interrelated causes.

China, with over 1 billion people, is still largely an agricultural nation. Some areas are seriously threatened by soil erosion, a problem that has concerned the government since the late 1950s and has been acted on with some success. Soil erosion reduces agricultural productivity and undermines port development and the navigation of river channels because of siltation. It also causes rivers to spill over their banks resulting in life-threatening floods.

South China's hilly Guangdong Province has been particularly hard hit. About one-third of the province's 110 counties have eroded areas larger than 100 km<sup>2</sup>. Many countermeasures have been tried: e.g., the planting of trees and other vegetation, the building of check dams and water-diversion channels, and the use of terraces. In some cases, interventions are working; in others, they aren't. The root of the problem is a lack of scientific understanding of how these actions reduce the effects of erosion.

IDRC's Earth and Engineering Sciences Division is supporting a major project in Guangdong Province to investigate soil erosion. Scientists from the Institute of

Geography in Guangzhou, China, and from the University of Toronto in Canada are examining its causes and its biophysical and socioeconomic impact. The joint research program calls for the monitoring of rainfall, soil moisture, groundwater, overland flow, and other erosion-related factors. The impact of current erosion-control measures will also be evaluated. The most significant outcome of this work will be recommendations for improved land management.

## Getting the Most out of Radar

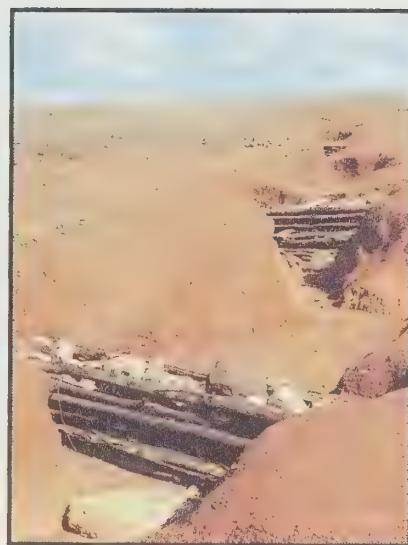
The Chinese province of Gansu is frequently hit by flash floods and hailstorms that badly damage the wheat, corn, and millet crops. Recognizing the problem, the Lanzhou Institute has been using standard weather radar technology to study the structure and distribution of these surprise meteorological events so that they can be predicted. The radars, however, are not equipped with digital recording and computer analysis systems. Such systems would enhance the tracking of cloud formations and, in turn, improve the speed and accuracy of storm and flood predictions.

A joint IDRC project between the Lanzhou Institute and McGill University in Montréal is giving the Chinese an opportunity to enhance their radar system and develop the necessary expertise in computer-assisted analysis. This will improve the forecasting not only of damaging storms but also of rainfall in general. As a result, water-resource management, especially for irrigation, should also improve.

Recently, IDRC's Information Sciences Division agreed to fund a major flood-related project in South China. The grant will enable the Laboratory of Resources and Environment Information System to set up a geographic data base on the Dongting Lake Region, a fertile agricultural area that is highly susceptible to flooding. The computerized system will contain topographical, meteorological, and hydrological data, as well as maps and information about the availability of relief materials. The project staff will develop a method for updating the information using remote-sensing techniques and data. In the future, when floods strike, this computerized system will help improve the efficiency of damage control and management. Another highly practical outcome of the project will be the production of a regional atlas containing about 70 thematic maps.

## Gashes in the Mountain

The erosion problems of the tiny mountain kingdom of Swaziland, in Southern Africa, are similar to those of



*Stone-and-log barriers against erosion in Swaziland.*





*Dongas, or gullies, carry sediment to lower ground, where it clogs rivers and streams.*



*Cause and effect: overgrazing and erosion.*

South China. The flow of water across degraded slopes has slashed huge gullies into the landscape. These “dongas” are largely the result of human activity. Farmers clear and cultivate the land and then leave their cattle (often too many) to graze. With much of the plant cover gone, the fragile soil is easily washed away. Aquifers lose their water through the dongas and, because of the increased runoff, don’t recharge as quickly. This lessens the amount of potable groundwater available for local villagers. Downstream, the sediment clogs streams, rivers, and culverts, and weakens the foundations of roads and bridges.

A Swazi–Canadian team of researchers is now examining in more detail the causes of dongas and how the water regime of the area is affected. They hope to identify remedial actions that will halt this disturbing deterioration of Swaziland’s ecosystem.

Finally, IDRC is supporting a joint Bolivian–Canadian effort to understand a perplexing and serious flooding problem in Bolivia. The high-altitude “altiplano” region of Bolivia has a subtropical, semi-arid climate with highly irregular annual rainfall. In the past three decades, rainfall variation has become extreme, with periods of intense and frequent rainfall as well as periods of drought. This climatic shift is causing serious flooding in the drainage basin of the altiplano — a densely populated mining and agricultural area. The water levels of the Desaguadero River and lakes Titicaca and Poopo have risen and two new lakes have been created since 1960. In recent years, floods have damaged large tracts of farmland, destroyed thousands of houses, and forced the evacuation of whole communities.

Unfortunately, in the absence of a scientific understanding of the area’s changing hydrological system, it is impossible to design effective antiflood measures or strategies of water conservation and management. With IDRC support, scientists from Laval University in Quebec, Canada, are working with their counterparts at the Universidad Mayor de San Andrés in La Paz and the

Universidad Tecnológica de Oruro to provide this information and propose concrete measures to control flooding. This kind of pioneering scientific work is a necessary first step in rehabilitating the lands along the Desaguadero River. Without it, the area will remain at the mercy of this bewildering change in climate and geography.

## INFORMATION FOR SPECIALISTS

Scientific and technical knowledge is not static. True, the broad conceptual models, or “paradigms,” that direct day-to-day research may change only once in a generation. However, there is a constant accretion of results from those paradigms: new puzzles, corrections of theory, novel applications, technical innovations, and warnings of blind alleys along the perilous path to knowledge.

Organizing and making those results accessible — especially the innovations — is the job of the information scientist. Without up-to-date information, wheels get reinvented and blind alleys disappoint yet another unwitting water engineer or handpump designer. The chronic water supply “emergency” of the developing world begs for quick access to information on proven, appropriate technologies.

### Networking in Latin America

Well before the beginning of the UN Water Decade, IDRC’s Information Sciences Division was busy playing the role of international midwife in the creation of information centres and networks to serve the needs of water specialists. In the mid-1970s, the Division supported the design, establishment, and operation of the Latin American Network on Information and Documentation in Sanitary Engineering and Environmental Sciences (REPIDISCA). With headquarters at the Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente (CEPIS) in Lima, Peru, this network now has 135 collaborating member centres in 14 countries of Latin America and the Caribbean. The centres identify and select documents such as books, journals, technical reports, theses, working documents, research findings, and presentations to congresses. They describe and analyze the content of each item and submit the information to the network’s bibliographical data base. REPIDISCA is a good example



of effective information sharing at the regional level, and efforts are under way to replicate the concept in Africa and Asia.

With REPIDISCA fully operational, IDRC's direct support has ended. At the national level, however, IDRC continues to provide assistance to information bodies wishing to join the regional network. Such projects are being conducted in Argentina, Guatemala, Nicaragua, and Peru.

African and Asian countries are also beginning to use information networking in the area of water and sanitation. In West Africa, for example, IDRC is supporting the documentation centre of the Comité interafricain d'études hydrauliques (CIEH), based in Burkina Faso. In addition to strengthening the centre's operations, the project will set up a water and sanitation information system to serve other countries in West and Central Africa.

The Asian Alliance of Appropriate Technology Practitioners (APPROTECH), based in the Philippines, has 38 member NGOs in eight countries. All are involved in grass-roots development work and are in need of access to pertinent information on the provision of water and sanitation. APPROTECH has received an IDRC grant to set up an information system to fill this need. Information produced by Alliance members is being collected, organized, and disseminated. The project will also produce a directory of the network's water and sanitation projects, a registry of experts, and a bibliography of appropriate technology.

In Sri Lanka, NGOs also play an important role in community water projects. An IDRC grant to the National Water Supply and Drainage Board is being used to set up a water and sanitation documentation centre. This centre will serve as the information hub of a country-wide network of NGO field-workers, university personnel, and government workers. A similar project at the governmental level is under way in Indonesia.

## Key Water Words

One of the most recent fruits of IDRC-supported labour is the *Interwater Thesaurus*. Published in 1988 by the International Reference Centre for Community Water Supply and Sanitation (IRC) in the Netherlands, it provides a structured, multilingual list of key words used to index and classify documents on rural water supply and sanitation. This publication will undoubtedly be of use to water-information specialists around the world and will ensure consistency in the processing and recording of new documents. IRC, in cooperation with IDRC, has also published *Handpumps: issues and concepts in rural water*



Some publications on water supported by IDRC.



supply programmes. This publication (IRC Technical Paper No. 25) covers several aspects of water supply and stresses community involvement in all project phases.

Finally, IDRC continues to provide funds for the publication of *Waterlines*, a quarterly magazine on appropriate technologies for water supply and sanitation. Published by Intermediate Technology Publications Ltd., in London, U.K., it is aimed at professional and technical personnel in developing countries. The most recent grant will support the publication until the end of the Water Decade and permit it to develop a marketing strategy to ensure its survival in the 1990s.

The Information Sciences Division is now reviewing its water and sanitation information program. This will ensure that, for the rest of the Water Decade and beyond, its assistance is carefully coordinated with the efforts of other international agencies.

## CONCLUSIONS

Water is among the most important of the raw materials of life. It can also be a destructive and terrifying force beyond human control. The quest for an adequate quantity and quality of fresh water and for ways to tame its natural might is a human imperative, a permanent preoccupation.

*Students gather to learn pump technology in Ethiopia.*





The explosive growth in world population and the industrialization of the 20th century have put increasing demands and ecological pressure on our water supply. It is becoming increasingly difficult to protect water from the hustle and bustle of daily human activity, especially in the large cities of the developing world. This reality demands the application of ordered thinking and practical solutions — in short, research and development.

For 18 years, IDRC has supported and promoted the work of scientists and technologists in developing countries; much of this work has focused on the role of fresh water in people's day-to-day lives. In some cases, Canadians have worked in partnership with these men and women. New knowledge and expertise have been created, and an arsenal of cost-effective, appropriate water technologies is slowly being established.

The UN Water Decade will soon be over. Although its optimistic goals will not have been fully achieved, tangible progress has been made. For millions of people, the Decade has meant that fresh water is now a safe and reliable resource rather than a chronic health hazard. In the global context, IDRC's contribution has been modest but significant. It has helped put the pursuit of the human imperative on a more scientific footing.

## BOOKS AND FILMS

The following books and films are on water-related issues. Produced by IDRC's Communications Division, they can be obtained by contacting the Head Office (IDRC, P.O. Box 8500, Ottawa, Ont., Canada K1G 3H9) or any of the regional offices of IDRC (see back cover). IDRC films may be purchased or borrowed and publications are distributed free of charge to developing countries and at a nominal charge to the developed world. IDRC publications are also available in microfiche form.

### Books

*Evaluating health impact: water supply, sanitation, and hygiene education* — J. Briscoe, R.G. Feachem, and M.M. Rahaman, 1986, 80 p., IDRC-248e, \$8.00

To set priorities and allocate funds rationally, health authorities in developing countries need to know what impact water and sanitation programs have on health. This monograph, sponsored jointly by UNICEF and IDRC, summarizes the results of a 1983 workshop in Bangladesh

hosted by the International Centre for Diarrhoeal Disease Research. The meeting addressed several topics: e.g., the conditions under which health impact evaluations should be undertaken, indicators for measuring health impact, study designs, and how results can be interpreted.

*Laboratory and field testing of handpumps* — Goh Sing Yau, 1985, 138 p., IDRC-TS51e, \$10.00

This publication describes laboratory and field-testing protocols for polyethylene and PVC pumps. A mathematical analysis of the reciprocating pump, a method of optimizing the design of valve assemblies, two computer programs for data acquisition and processing, and standard field survey forms are included.

*Women's issues in water and sanitation: attempts to address an age-old challenge* — 1985, 104 p., IDRC-236e, \$12.00

This book reports on an international seminar held in Manila, Philippines, in September 1984. It discusses the problems and constraints that have limited the participation of women in water and sanitation activities. Areas for future research and ways to enhance the role of women in water and sanitation are identified.

## Films

*A handle on health* — 1986, 27 min, IDRC, available in 16-mm and video (NTSC and PAL)

Thousands of people in the developing world die each day for lack of clean water and proper sanitation. Women and children spend hours each day bringing home water that is often contaminated. This film shows how simple, durable handpumps can be designed, tested, and manufactured locally to provide clean water and employment opportunities, and to eliminate dependency on expensive foreign pumps and pump components. The film also shows how women, the primary drawers of water, can take control of the water-delivery system and its maintenance.

*Prescription for health: clean water, hygiene, sanitation* — 1983, 23 min, IDRC, available in 16-mm and video (NTSC, PAL, and SECAM)

In developing countries, waterborne diseases such as cholera, typhoid, and dysentery kill thousands every day. Children are the most frequent victims. Even when a source of drinking water is safe, polluted surroundings and lack of hygiene may contaminate the water, causing disease to spread. This film was shot on location in Bangladesh, Kenya, the Philippines, Sri Lanka, and



Thailand. Extensive animation has been used to illustrate clearly the path of disease and to unify the film's message for audiences of diverse cultural backgrounds. Produced in collaboration with the World Health Organization and Oxfam, *Prescription for health* is aimed primarily at health-care workers and water and sanitation engineers and technicians in developing countries. It is a prime source of information for policymakers. A user's guide is available in cases where the film is to be shown for health-education purposes in the developing world.



*Fresh, clean water for all . . .*

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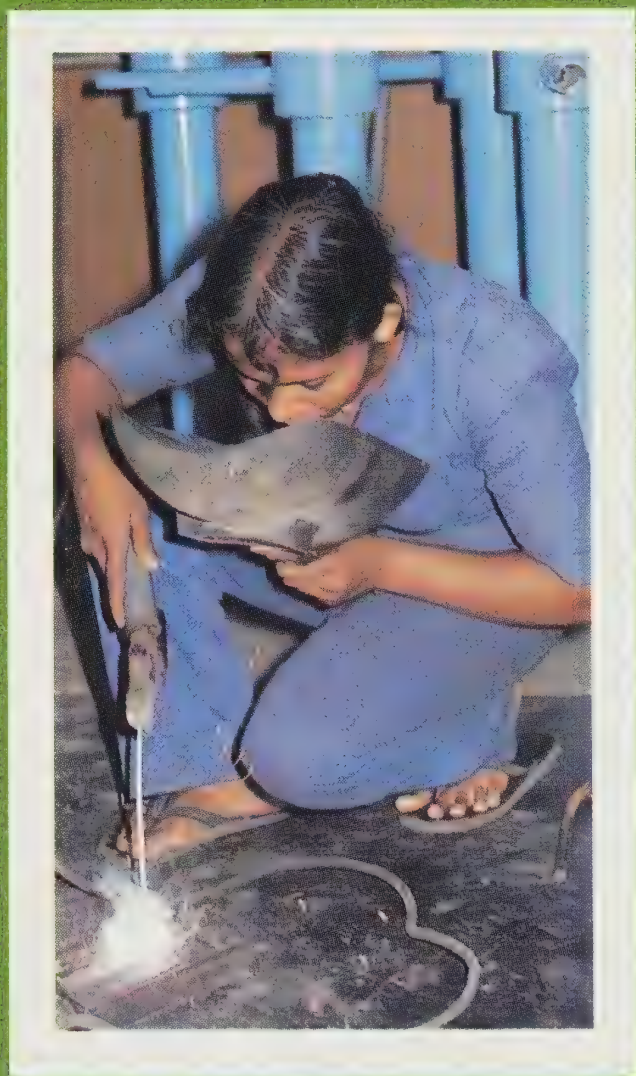
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Figure 10-10











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